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EDITED BY

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NATURAL HISTORY NOTES.

EDITED BY FRANK J. ROWBOTHAM.

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IMPERFECTIONS IN NATURE.*

Genesis speaks of Creation as "very good," not as perfect; but attempts to account for such apparent imperfections as snakes, toil, thorns, thistles, and child-bearing, by the theory of a Divine curse. The teleology of the last century, which still influences the Duke of Argyll and Professor Owen, looks upon Creation as anthropocentric, and as the expression of Divine ideas. Evolution sees Creation to be self-regarding; snakes, thorns, beautiful flowers, and horses that would have been serviceable, existing ages before man; and absolute perfection (*i.e.*, fitness for existence or adaptation to the environment or the conditions of existence) being as absent from the works of Nature as from those of Art. Were all parts of Nature equally perfect, there could be no deaths, no exterminations, no struggle for existence. This struggle is exemplified in the mortality among young carrion crows, the bird seldom rearing more than three young from five or six eggs; and in the fact that a foxglove will produce a million and a half seeds in a single year. Nature is very wasteful, not of matter, nor of energy, but of the availability of energy. Energy is the power of doing work, but only does work when transformed from one form into another, as money is of use only in circulation; and there is a general tendency of all forms of energy to become transformed into heat, which becoming equally diffused, becomes useless for the production of work. Applying this doctrine of the Dissipation of Energy to the Universe at large, we must regard the Sun as a lamp burning out, a man living on his capital, whose energy derived from condensation is being fast radiated; in the Earth we must contemplate the ceasing of contraction or of volcanic upheaval, the triumph of the denuding agents, and the evaporation of the

* Abstract of a letter delivered before the Sunday Lecture Society, December 4th, by Professor G. S. Boulger, F.L.S., F.G.S., F.R.G.S.

ocean, before our welding into the mass of the Sun; and in the whole Universe energy must become diffused as equable heat in the all-pervading ether. In the Organic World we see a similar squandering of vital, heat-producing energy in the clouds of pollen formed wholesale by firs, chestnuts, and other wind-fertilized trees, and in the 100,000 billion annual offspring of an *Aphis Fabæ* (Bean Plant-louse). That an organism succumbs in the struggle is evidence of imperfection, permanence being essential to *absolute* perfection, and thus the less perfect forms escape our notice by becoming extinct.

Dividing the structural imperfections in Organic Nature into General, affecting an organism generally, and Special, affecting single organs, in the first class we have too stable or non-plastic forms, as in the plants of St. Helena and New Zealand, and the seals of the Caspian; divergences from a suitable type, as in the Albino pigs in Virginia, poisoned from loss of the power of smell; synthetic or generalized types, as Palæotherium, Oreodon, Lepidosiren, Ornithorhynchus, &c.; and transitional forms, as among semi-flying squirrels. Among single organs we have the generalized nerve-end-organs or "marginal bodies" in Medusæ, and other eyes that only perceive light, not forming an image; many vibrations are imperceptible to us either as sound or as light, and our eyes are over-delicate, little protected, easily worn out, and imperfectly corrected for both spherical and chromatic aberration; and nearly every animal has useless rudimentary organs, the fœtal gills in *Salamandra atra*, fœtal teeth in whales and calves, hind-limbs in boa-constrictor, undeveloped ovules in oak, chestnut, and palms, our own often decayed wisdom-teeth, the appendix vermiformis of the large and diverticulum of the small intestine, and the serrated sting of the bee, which show waste of nutrition, and may, as in the last case, frequently cause the death of the possessor.

Man, the lord of the Creation, is by no means perfect, as even the poet testifies; Nature tried

> "her 'prentice han' on man,
> And then she made the lasses, O!"

G. S. B.

THE NATURAL HISTORY OF LONDON.

No. 1.—Notes on the Fauna and Flora of London.

By Henry Walker, F.G.S.

The new volume of Natural History Notes, says our friend the Editor, might well begin with a paper on "The Fauna and Flora of London." And he is right. No better subject could be chosen, if the object of this useful little serial is to do anything towards educating the contingent of observers which London ought to contribute to the army of amateur naturalists. The only question is, Who will undertake to write such a paper? Where is the valiant and omniscient individual who will put his signature to such an undertaking? In the first place, he ought to be a very young man. The middle-aged naturalist gets a good deal too wary for this kind of enterprise. Looking back on his earlier books he thanks goodness he wrote them when he was young, or he would never have had the audacity to write them at all.

And I am not now, even after twenty-five years of perambulation of London and the environs, about to "bend up," as Macbeth says, "each corporal agent to the terrible feat." The Fauna and Flora of London have my great respect and esteem, and so have the special faunists and phytologists who look after their favourite classes, orders, and families, and write monographs thereon. The humbler office I have undertaken is to give some notes and hints to observers who want to know how and where to look for the flora and fauna within about four miles of Charing Cross.

There is no excuse for a Londoner not being a botanist or a zoologist, so far, at least, as material for study is concerned. Did not the veteran Westwood write his *magnum opus*, "The Classification of Insects," in a London house, getting most of his types from his own garden!

The travelling of insects from the remoter parts of England (sometimes involuntarily) to the Metropolis has often surprised many entomologists of experience. The late Edward Newman told me he was much puzzled at having brought to him by a stranger a local New Forest Fritillary, which had been caught at the South Western Railway Station at Waterloo Bridge. His visitor was an entomological porter in the Company's employ. This man was great in moths, and by watching the night arrival trains, he had

actually made a good collection of what he considered unquestionable Hampshire specimens.

"Why not?" quoth he; "the trains, lighted up, run by the New Forest, and through plenty of good ground, and the moths fly to the lights. So I've got my best Speckled Footmen."

The same kind of thing is happening to-day, to my own knowledge, at Paddington Station; an entomological signalman, whom I have had the pleasure of knowing for some years, has taken the handsome Silver-washed Fritillary at this depôt, and at Westbourne Park Station the Broad-bordered Bee-Hawk Moth. I am told, too, by a Camden Town collector, that the Death's-head Moths occasionally taken at Euston Station probably come from the well-known breeding-grounds of this insect near Watford—the potato-fields. The railway redistributes our fauna in more ways than one. Look, for instance, at the varied flora of our railway cuttings.

Whilst on street entomology, I may refer to a capital paper in the "Entomologists' Monthly Magazine" on "Moths taken at the London Street-lamps." The writer used to fee the lamp-lighter, and in the course of a single season got a remarkable collection.

Foreign beetles, too, are sometimes found in our London streets. Mr. Pascoe has recorded an American buprestis thus captured, and an Australian form *(Tropis dimidiata)* which he took near the South Kensington Museum. Interesting natives are sometimes found, *e.g.*, the Churchyard Beetle *(Blaps mortisaga)*, found on a doorstep near Soho Square.

"House Entomology; or the Entomology of a London Sitting-room," was the title of a paper once suggested by the same zoologist, who says it would be possible to reckon up some sixty insects —flies, tipulæ, moths, beetles, &c., as common visitors or residents in our houses. Here is a hint for the stay-at-home student of entomology. And let him not overlook the ants. I knew a medical student who got so used to the flavour of the red ant with his daily bread, that when he changed his lodgings and his larder, he quite missed the usual relish with his food. He used to say the fore part of the ant tasted quite differently from the hind part; he fancied he could localise the formic acid with his tongue!

The birds of London are a delightful subject for a whole chapter. For several seasons a pair of hawks built their nest and reared their young in safety between the wings of the golden dragon which formed the weather-vane of Bow Church, Cheapside. A distinguished naturalist writing to "The Field," in 1876, recorded an

instance of a pair of kestrels rearing their young among the coils of rope around the legs of Nelson on the column in Trafalgar Square. Certainly, with such a quarry of pigeons and sparrows, kestrels ought to do well in London.

The list of wild birds that may be seen in the London Parks would surprise most people. Some few years since, I gave some papers in the "Leisure Hour" on "The Birds of Kensington Gardens." Living near the spot, I devoted myself to the study of the migrants who come thither every spring, some from the olive-groves of Spain, the sunny plains of Africa, and still more distant regions in which they have passed the winter. I have recorded twenty-six visitors, and eight permanent residents.

The wild flora of Kensington Gardens has been described in the "Journal of Botany" by Mr. Newbould and the Hon. Leicester Warren. These gentlemen have catalogued one hundred and eighty odd indigenous plants in these Gardens, many of them interesting survivals of the primitive unenclosed condition of the ground.

Some years ago Mr. H. P. Stock, a member of the Kensington Entomological Society, showed his collection of thirty-two butterflies and moths (only a selection of the whole number) he had taken on his daily passage through Kensington Gardens to his office. I fancy the list, which I undoubtedly have by me, will some day be found among my muniments. I commend it to posterity, as also my memoranda of the land shells of the said Gardens, and certain notes as to the former existence of *Clausilia biplicata* in Hyde Park, near the Serpentine.

Let me stop to lament the disappearance from the Blackheath ponds of the beautiful "Fairy Shrimp," *Chirocephalus diaphanus*. I used to find it there fifteen years ago. Another phyllopod, *Apus cancriformis*, has similarly disappeared from Bexley Heath.

The very interesting aquatic flora and fauna of London will be found further noticed in my "Saturday Half-holiday Guide" for 1873 (the last edition, be it known, for which I am responsible, that publication being now in different hands).

The fossils and minerals met with in our London streets and suburbs, *e.g.*, the curious fulgurites, or fossil lightning-tubes, of our common flagstones, are topics which my limited space excludes. In the course of twenty years I have made, and dispersed, several collections. Hardly a month passes without a visit from some friend, or geological *protégé*, who brings me a sea-urchin or ventriculite from the gravels of our suburban roads. As for the variety of rocks to

be found in our streets, their name is Legion, and the study of petrology by means of the microscope is stimulating every real observer to add to his collections from any and every source.

A word about street-zoology, and our non-indigenous fauna. Why the fishmongers' shops alone are enough to make one a naturalist, apart from the fishes proper—and I always look out in April for the Gar-pike, and especially the gaudy-coloured male Lump-fish *(Cyclopterus lumpus)* at the same season, and the Sun-fish in autumn, and sometimes the Eyed Blenny, or Butterfly-fish. Apart from these, think of the smaller and so-called lower forms—the beautiful sea-firs and other hydroids attached to the oyster shells; the greenish leathery-looking ascidians, and the harvest of diatoms you may take out of their stomachs, some of them deep-water forms like the rare *Biddulphii regina*, difficult to obtain in any other way. Even your newly-purchased bath-sponge should yield you some foraminiferæ by careful washing. Alas! how vast and cyclopædic is the subject of the fauna and flora of London to one who is willing to get "cues from all quarters."

Altogether I fancy there must exist in one of the several books which have confessedly dropped out of the canon of Scripture this invaluable hortatory text for us naturalists:—"He that hath eyes to see, let him see."

No. 2.—Garden Entomology, &c.

The police reports, our criminal classes, industrial schools, unscientific quarrels with scientific people, unworthy literary squabbles, &c., have so overfed us with the *unnatural* history of London, that it is refreshing to turn from it and be reminded that there is a natural history of the grand, old, and ever new city.

Even little boys and girls can be taught to observe this as they are wearily and drearily dragged along the streets, or dressed up to be proper, and wholesomely (?) chidden into social drill in the parks. A little Nature supplied to them by governesses and parents turning themselves into fellow-workers and observers, and renewing their own youth as they once again, as children, lie on the lap of mother Nature, and simply and obediently listen to her teachings, would help us all to say what is so seldom heard in this beautiful and good world,—"It is good for us to be here."

It is wonderful how much there is of curious and interesting phenomena overlooked by most of us.

To begin with a very limited space, and its at present seemingly unlimited marvels, I will confine myself to what I insisted should be called The Park, in mockery and satire, my dreary, gritty, sandy, bad-mouldy back yard, about 60 feet in diameter, and of shapeless circumference. Should I cultivate it? No, that would be cruelty to plants. But a mocking member of my family went on a "tour round *the park*," and brought from it a huge bouquet of "flowers," as he derisively called the weeds.

"That fetched me." I was, as a botanist, delighted with the bouquet. My Park is a retired garden—very much retired, I may say—but it has kept me in work and happy mischief all the past year. I have changed its name, however, to that of the Caterpillarium!

The *Polygonum Persicaria* abounding there led to the superstitions connected with the markings on the leaves being discussed in this magazine, and suggested my contributing some day a few remarks on Plant-symbolism.

On the Polygonum and other plants I found six species of caterpillar; started a small insectarium in my microscope room; and am now watching or waiting for various transformations of the caterpillars. An old bandbox without a lid, and with the bottom knocked out, makes a capital case for observation. Stretch a piece of coarse mosquito-netting over the top of it, and when the moths and butterflies emerge you can observe or capture them easily. By the way, is not the word butterfly a corruption, or base survival of the more appropriate *flutterby?*

Among my caterpillars was the handsome *Pygæra Bucephala*, which is frequently to be seen in the streets of London. It falls from the trees when the leaves fall, or with the falling leaf, and "goes on the rampage" to find mould or earth in which to bury itself. My specimen has thus buried itself in a large flower-pot saucer filled with damp mould.

The caterpillar and butterfly are both beautifully drawn and coloured in "Curtis," Pl. 530.

The common Vapourer, or *Orgygia antiqua*, abounded on every weed. "It is a very curious thing, and I believe hitherto unobserved, and therefore unpublished, that the eggs do not hatch all together like those of moths in general, but come out a few at a time, over a period of ten weeks, &c."—E. Newman: "British Moths," p. 40. *Clisiocampa Neustria* also abounded, and the larvæ are now in their "tent or web." Then, too, I found dozens of that cannibal, the *Scopelosoma*. E. Newman, p. 371, says that one

"monster had actually murdered fifty-seven of his fellow-prisoners, and devoured their bodies." Nature is both cruel and immoral. My specimens, not content with eating each other, actually devoured one or two recently formed larvæ of the *Clisiocampa*.

This will give a little idea of one branch of the Natural History of London, to be studied in a few square yards of an uncultivated back garden in Kensington. S. M., F.R. Hist. S., &c., &c.

A CHAPTER IN EVOLUTION.

If a number of dogs, who generally eat rabbits, but sometimes hares, were cast on an island with those animals, would not *two* breeds of dogs arise—one adapted for unearthing rabbits, the other for catching hares—supposing their organisation to be slightly plastic?

Mr. Darwin's view of the case is this :—That the rabbits would become rarer as the dogs eat them, and that only those dogs would survive and breed who could catch hares; and so a long-legged breed would appear, adapted for catching hares. But as these dogs could not dig out rabbits, the rabbits would become common and the hares rarer.

Then, according to Mr. Owen, a short-legged breed adapted for unearthing rabbits would appear again, and so on *ad infinitum*.

But as the dogs ran faster, so would the hares also, and only those hares would survive who could escape the dogs. Thus, some of the swiftest dogs would keep to the hares, and of the rest only those would survive who could exist on rabbits; of their offspring, those with the shortest and strongest legs would have most chance of surviving.

Two breeds of dogs would then exist; and, because their attention would be divided equally between the hares and rabbits, neither would be exterminated. It is also to be noticed that intermediate types would soon die out.

I am not aware whether this side of the question of Evolution has been noticed before; and I shall be happy to hear any objections the readers of NATURAL HISTORY NOTES may have to this theory. E. H. H.

THE DISEASES OF CORN.

It would naturally be thought that a subject like this would receive attention in the text-books of Agricultural science. But, though the farmer may search diligently, he will not find anything relating to the subject, save a few obscure remarks, indicating how

little is known of these pests. Surely, at a time when the State Agriculture is so much thought about, scientific men would be well rewarded if they could, by studying the habits of these parasitic fungi and insects, devise some means by which they could be reduced or exterminated.

These diseases appear to proceed from two causes, viz., parasitic fungi and some minute insects. As different species of flea and louse infest different animals, so also different species of fungi are found on different plants, and even on distinct parts of the same plant. Thus, in wheat, one species is found on the grain, another on the pedicel, and three others belong to the straw, leaves, and chaff.

Among the most dangerous fungi which affect corn crops are :—

I. The Bunt, Smut-balls, or Pepper-brand.—This affects only the grain of wheat, and can easily be recognised by the disgusting odour it emits. Under the microscope it appears to consist of a vast number of extremely minute dark globules, attached to a mass of matted, thread-like matter.

This disease greatly deteriorates the value of the corn, as the flour is almost useless for bread-making on account of its offensive odour. Manufacturers of ginger-bread use it extensively, as they find that the odour is disguised by the treacle and other materials they employ.

II. Smut, or Dust-brand.—This fungus is often confounded with the last, but it has no offensive smell. It first occasions the innermost parts of the flower to become abortive, while the little stalks on which they are seated swell, and become very fleshy. The fungus then consumes the fleshy part, and at length appears between the chaff-scales in the form of a powder.

This produces no injury to the crop, save by diminishing the produce, as the spores are ripened and dispersed by the wind before harvest.

III. and IV. Rust, Redrag, Redrobin, or Redgum.—These are supposed to be caused by two distinct species, viz., *Uredo rubigo* and *U. linearis*. They form yellow and red spots, or blotches, upon the stem, leaf, and chaff, and consist of minute grains. They prevail more among rough-chaff wheat than other varieties, and by some are considered to be same species as the Mildew, in a different form or state of fructification.

V. Mildew.—The common name of rust is often applied to this as well as the two previous fungi. In nearly all points they are similar.

Amongst the diseases caused by insects, the most peculiar is the *ergot*. It is the result of a morbid alteration of the grain produced by the puncture of an insect of the genus *Musca*, which deposits a very dark-coloured liquid. It has but seldom been noticed in wheat, oat, or barley crops, but is often prevalent in rye.

Many toxicologists rank it amongst narcotic-acrid poisons; others as a poison *sui-generis*. It produces gangrenous diseases which often cause the loss of limbs, and even death. Last century this disease was of frequent occurrence in France.

Earcockles, Purples, or Peppercorn (*Vibrio Triciti*).—The grains affected by these curious creatures turn black. In the interior of the grain is a cottony mass, which the microscope reveals to be a multitude of eel-shaped animalcules. When young they are about $\frac{1}{33}$ of an inch long, but under favourable circumstances they reach the length of a quarter of an inch. Like most of the simpler organisms, they are very tenacious of life.

Wheat, Midge, Thrips, and Aphides.—These are small flies of different species, which one often sees on a warm summer's evening flying about a field of wheat for the purpose of depositing their eggs in the ears of corn. When the larva is hatched it eats its way out, and so destroys the grain.

These flies suffer much from the ravages of parasites, which, by laying their eggs in the bodies of the insects, in time cause the death of the latter.

Although the attacks of the lower organism cannot be altogether avoided, there are a few simple rules by which farmers could greatly lessen their danger. These rules I hope to be allowed to point out at a future time. H. E. J. Irons.

NOTES AND QUERIES.

"Friendship on All-Fours," No. 2.—We have received from a correspondent a pleasant little story (unfortunately too long for insertion in full), showing a strong attachment evinced by a tom-cat towards his former playfellow, a kitten, and the master and mistress to whom the kitten belonged. Though twice carried off, when his owners moved away from the next house, he persistently returned to his old friends and playmate; and our correspondent relates that "His wanderings are often nocturnal, and it becomes my pleasing task to get up in the deadest hour of the night to let in or out poor pussy of the long memory." "What,"

adds our correspondent, "can be done with such a cat? One can but admire such constancy, though I am afraid if wishes could kill, pussy would have been a dead cat long ago."

Curious Birds.—A *blackbird* frequents my garden, having a white feather in his tail. I do not know whether this would be considered as a distinction, or otherwise. When I lived near Tooting Common, some years ago, a *thrush* with a red breast came to the garden two or three seasons. I mentioned the circumstance to a distinguished ornithologist, who said that such birds were rare, and recommended me not to mention the subject to any collector possessed of a gun.

Torquay. G. H. W.

Tree-frogs.—I have a few tree frogs from Mentone, S. of France, and during the summer I have fed them on flies and blue-bottles, but now the cold weather has set in there are none to be had. Could you inform me what is the best food to give them through the winter months, as I am anxious to keep them alive? I may add that they are kept in a fernery which is warm.

G. W. Bradshaw.

[It is extremely probable that your tree-frogs will not touch food during the winter months, being the season of hybernation. Try them with ants' eggs, dead flies or blue-bottles, pieces of raw meat, &c. Perhaps some of our readers can assist you by giving their experience.—Ed.]

An Animal Superstition.—In the Rig-Veda a horse is led out to sacrifice, with a goat bound to it and going before. The goat is sacrificed first, "announcing the sacrifice to the gods." Why should the goat be thus associated with the horse? and why are goats now kept in stables? People who thus keep goats say that they are healthy animals; that they are scavengers, eating any refuse which would otherwise decay; that the goat absorbs anything injurious in the atmosphere, and passes it off in its offensive but harmless smell. But the strangest reason I have heard is this: If there is any disease abroad, the goat takes it, and so saves the other animals. This sounds like a survival of the old idea, that a disease was caused by a demon, who would be satisfied if he dwelt in some animal, and reminds me of a practice said to have existed among some Eastern savages, whose medicine-man could conjure their sins into the body of a goat, by slaughtering which they escaped the wrath of a fiend they dreaded, who in this case, I think, was Juggernaut. E. S.

Effects of Mild Season.—I have in blossom out of doors at the present time, violets, pansies, wild daisies, double daisies, chrysanthemums, marigolds, wallflowers, single and double stocks, mignonette, primroses, primulas, polyanthus in bud, veronica, pink silene, a white anemone, and periwinkles; the latter are quite profuse, and I am sorry to say the Lent-lilies are above ground. It shows how very mild the season is for December, but I fear the cold weather will come, and then good-bye to our spring flowers.

Sopley, Hants, 4 *Dec.*, 1881. R. J. P.

Scales of Apatura Iris.—A microscope will show that the scales of the Purple Emperor are brown on one side and purple on the other; and this is the reason why the scales appear with different colours in different lights. For if the light falls on the brown side of the scale the wing appears brown, but if it is reflected from the purple side the wing is iridescent. E. H. H.

Noise Made by Hare.—On the night of November 6th, as I was walking along a lane, I heard a noise very similar to that made by drawing the teeth of a comb sharply across one's fingers, which occurred at regular intervals of about four seconds. I found that the sound proceeded from a hare that was sitting about twenty yards distant in a field. Upon the hare being scared away, the noise ceased, but was recommenced directly the hare stopped still. I have never heard the noise before; can you inform me whether it is a natural sound, or was produced by illness?

Leicester. A. B. Plant.

Earthworm.—Is the earthworm found in tropical and arctic regions, or in the temperate only? A. B. Plant.

Dissection.—When dissecting caterpillars, I find that the blood coagulates and gets in the way. How can I kill them so as to prevent this? E. H. H.

Correspondence.—*Miss E. Bradley:* Accept our best thanks. Answer to query in our next. *E. H. H.*—Thanks. List in our next. *C. J. C.* and Others.—Names and addresses must in all cases accompany MSS., though not necessarily for publication. No notice can be taken of anonymous communications.

Note.—As Natural History Notes will be issued several days earlier than heretofore, communications should be sent in not later than the 12th of each month. Address, Ed. N. H. N., 42, Loftus Road, Shepherds Bush, London, W.

NATURAL HISTORY NOTES.

EDITED BY FRANK J. ROWBOTHAM,

(Memb. Geol. Assoc. of Lond.)

VOL. II. FEBRUARY, 1882. No. 2.

EVOLUTION, CONSIDERED IN REFERENCE TO THE MARSUPIALIA.*

It will possibly be within the recollection of some here present that at the last annual address to the Metropolitan Scientific Association, a portion of the ground occupied by the theory of the Evolution of living forms by modified descent was traversed by means of a few propositions worked out to their logical conclusions. I need scarcely say that the acceptance of the theory of Evolution is by no means universal, even by those who fully comprehend, realize, and understand the facts adduced; though the numbers of its adherents continue to augment, as the number of facts brought to bear upon it by palæontological research continue to increase.

That Evolution has been a factor in the production of *some* organic forms, past and present, meets with wide assent; the contention for the most part being as to the universality, means, and significance of the process. Many objectors to the doctrine are prepared to accept the theory as applicable in those instances where the proofs themselves are fully forthcoming, and stand patent to all, but retire upon some other explanation for allied circumstances where the facts and information at present to hand are insufficient to trace the process visibly from one organic form to a succeeding or allied one. I do not propose here to review the causes which have tended to produce this intellectual condition, on most other subjects not habitual to these objectors, but rather to assume that it arises from a carefulness to avoid error, and to seek truth wherever she may be found. To the student of science, it is necessary indeed to be biased neither by sentiment nor preconceived opinion, but to follow surely and safely along nature's pathway,—knowing that thus alone shall we reach the haven of truth.

It is doubtless to the Science of Palæontology that we must look for the most extended proofs and evidences of the truth or fallacy of this theory of Evolution of organic forms; and it is

* Opening Address for Session 1881-2 delivered by the President (W. H. DAVIS, Esq.), to the Members of the Metropolitan Scientific Association. Communicated by the Author.

exactly there that most of the difficulties and objections are to be found. If you will be good enough to accompany me, we will together traverse a small portion of the wide field that lies open before us on this subject, and, instead of culling here and there facts that tend to support one or another set of opinions, we will confine ourselves to one or two sections of a single group of facts that will fully illustrate the difficulties and the conquests of the theory, according to the evidences of Zoology and Palæontology.

For this purpose we will commence our enquiries in reference to a single group of the Mammalia, the lowest in the organic scale,—viz., the Marsupials. Now, if amongst the Vertebrata there is one group that taxes the resources of the Evolutionist more than any other it must, I think, be conceded that that group is the Marsupialia.

If for a few moments we examine the accompanying diagram of the distribution in time of the various mammalian sections, one of the first and most patent facts that forces itself upon us is that every mammalian form (so far as our knowledge extends), save one, came into existence during the Tertiary period. If we divide the Mammalia into twenty-three groups, or orders, fifteen took their origin in the Eocene period, one in the Lower Miocene, one in the Upper Miocene, two in the Pliocene, three in the Pleistocene, and only one anterior to any of these other twenty-two groups. That one is the Marsupial. In this particular case we have not, therefore, to explain its sudden incursion in a particular period in company with many other highly organised forms, as is the case with the fifteen groups commencing together in the Eocene period; for this particular difficulty as to the absence of ancestors of the fifteen groups suddenly appearing in the Eocene is one well known to the upholder of evolution. We may possibly find something to say as to the incoming of the Marsupialian group in the Trias period, but we can pass over any question as to its being created at the same epoch, and in company with the remaining principal forms or groups of mammalia; for, so far as negative evidence can possibly be trustworthy in character, there is the fullest evidence that Marsupials were the earliest mammalian forms on the surface of our globe. This group, therefore, opposes the first insuperable objection to a theory as to the creation at a given epoch of anything like a complete class, such as compose the mammalian fauna; although the number of special forms belonging to this division, appearing for the first time in the Eocene period, might otherwise tend to support such a view of the case.

Before we go further into the subject, as to the bearing or other-

wise of this order of the Marsupialia on the question of evolution, it will be necessary to roughly understand its relations to the other orders of the class Mammalia, and something of the history and peculiarities of this order or group itself.

RANGE OF MAMMALIA.*

	Trias.	Jurassic.	Cretaceous.	Eocene.	L. Miocene.	U. Miocene.	Pliocene.	Pleistocene.	Recent.
Marsupialia	—	—	...	—	—	...	...	—	—
Edentata	...	...	...	...	...	—	—	—	—
Cetacea	...	...	...	—	...	—	—	...	—
Sirenia	...	...	...	—	...	—	—	...	—
Perissodactyla	...	...	...	—	—	—	—	—	—
Artiodactyla	...	...	...	—	—	—	—	—	—
Bunodontia	...	...	...	—	—	—	—	—	—
Selenodontia	...	...	...	—	—	...	—	—	—
Hollow Horned Ruminants ...	...	...	...	...	...	...	—	—	—
Oreondontida	...	...	...	—	—	—	—	...	...
Proboscidea	...	...	...	...	—	—	—	—	—
Dinocerata	...	...	...	—	...	...	...	...	...
Toxodontia	...	...	...	...	...	...	...	—	...
Tillodontia	...	...	...	—	...	...	...	...	...
Rodentia	...	...	...	—	—	—	—	—	—
Cheiroptera	...	...	...	—	...	...	...	—	—
Insectivora	...	...	...	—	—	—	—	—	—
Carnivora	...	...	...	—	—	—	—	—	—
Pinnipedia	...	...	...	...	...	...	...	—	—
Plantigrada	...	...	...	...	...	...	—	—	—
Digitigrada	...	...	...	—	—	—	—	—	—
Quadrumana	...	...	...	—	—	—	—	—	—
Bimana	...	...	...	...	...	...	...	—	—

* From Prof. Morris' Presidential Address to the Geologists' Association, Session 1877-8.

(To be continued.)

AT WEYMOUTH FOR FOSSILS.

It would be a great boon to students of Geology if local geological guidebooks to all places of interest could be obtained, which should direct the visitor where to go, and what to look for when he got there. Weymouth is supposed to possess such a guidebook, and the work of Mr. Damon has a more than local celebrity.

Visiting Weymouth for the first time last autumn, I naturally turned to this well-known work, expecting to find in its pages a trustworthy guide, philosopher and friend. Perhaps I expected too much, for I was certainly disappointed. Several weary tramps did that book impose upon me to no purpose, and before the end of my short visit I had learnt to say, as Virgil would probably have done in my place, "*Timeo Damonem et dona ferentes.*"

The book, however, is by no means a bad one; its celebrity as a geological treatise is not unmerited. As a description of the Middle and Upper Jurassic strata in Dorsetshire, it is, I think, of considerable merit, and, for an English book, not expensive; but I do not consider it by any means a good *guidebook*. Some justification of these strictures ought perhaps to be given, and I will therefore briefly describe what I consider to be its shortcomings in this respect.

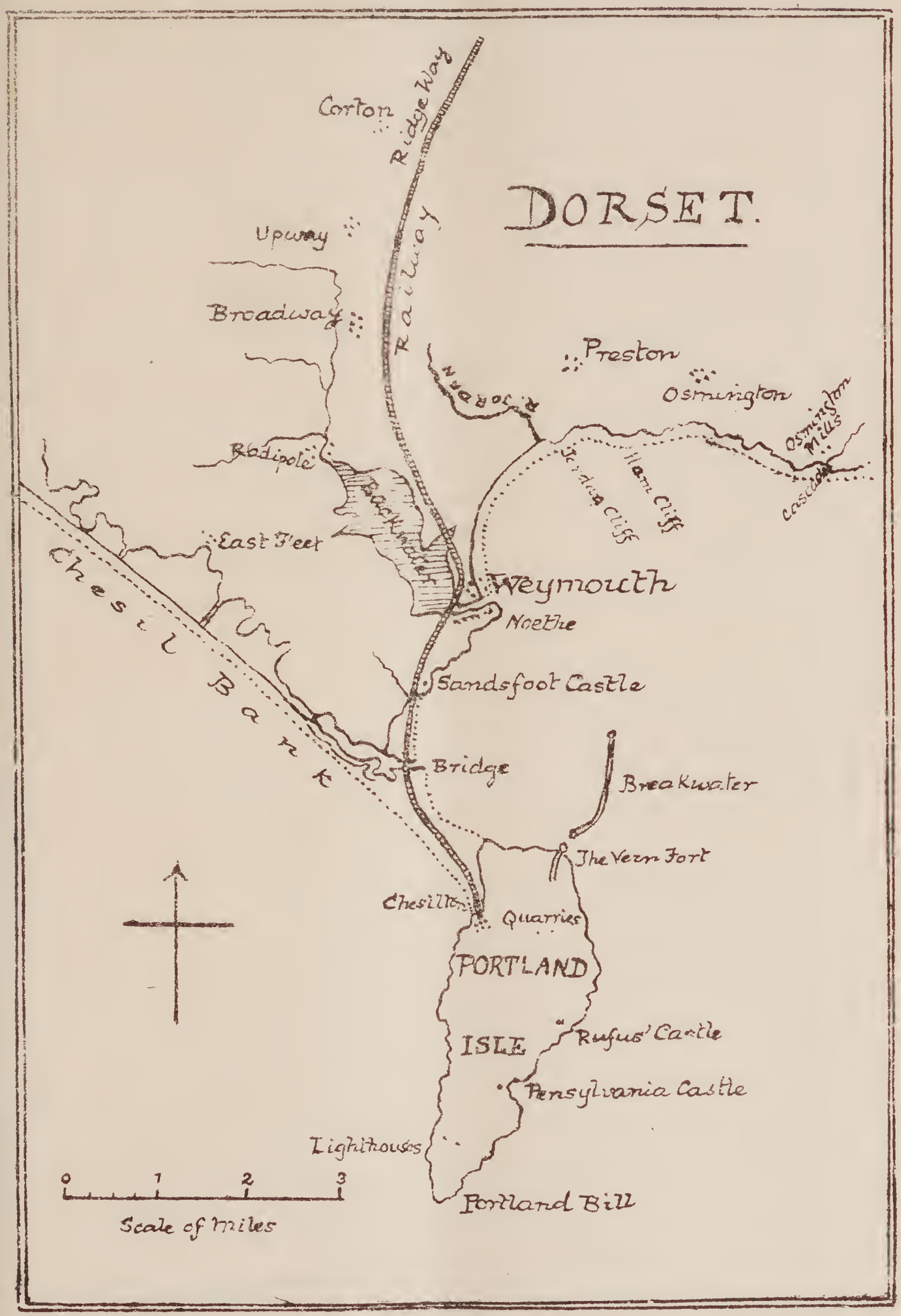
It is in the first place badly arranged, in following the order of the strata. Such an arrangement is, of course, proper for a scientific treatise, but in a guidebook one wants to find described at one place all that is to be seen at each locality. There will otherwise be danger of discovering in the evening that something has been missed in the day's excursion.

In a geological guidebook the description of the open sections is important. Now although Mr. Damon's work was published in 1860, it has apparently not been revised or added to in the slightest degree since that time. The consequence is that many of the sections described have long since disappeared, and the weary geologist, tramping the country in search of a forgotten quarry, interrogating the intelligent rustic as to "pits," and learning at last from an "oldest inhabitant" that the quarry in question was only worked for a few months, five-and-twenty years ago, is a sight for gods and men.

A guidebook should give exact and detailed information of how to find any particular place, giving for this purpose the local names

— MAP —

OF DISTRICT OF WEYMOUTH.



(To face Article entitled "At Weymouth for Fossils.")

of farms, fields, &c., and being profuse rather than scanty in these particulars. As a scientific treatise, Mr. Damon's work is the more interesting because it is not a good guidebook in this respect.

Having thus been rather severe upon Mr. Damon's interesting book, the reader may perhaps retort, "Why do you not write a guidebook yourself?" This, however, is a work demanding much care, time, and local knowledge, and if Mr. Damon's book be not perfect, geologists have much reason to be thankful to him for the trouble it must have cost him.

The following brief hints to intending visitors to Weymouth who have not been there before, are intended in no sense to supersede, but only to supplement that work, until such time as some one shall publish a perfect guidebook to the district.

Literature.—Intending visitors are strongly advised to "read up" the locality and the strata before starting, and to take with them as many geological works as possible. Besides Damon, I will refer only to the papers in the *Proc. Geol. Soc.* of the Rev. Prof. Blake on the Kimeridge and Portland series, and of Mr. Prestwich on the Quaternary Deposits of the district. These are invaluable. The plates of fossils published by Mr. Damon, price six shillings, will also be found very useful.

Itinerary.—I shall assume that the visitor has only seven days to devote to the district: a time far too short to examine it at all carefully, but a time which some of the readers of Natural History Notes may not be able to exceed. I shall then endeavour to point out how they may best distribute this time, so as to see the chief features of the district.

The "Fuller's Earth" (Bath Oolite) is said to be exposed at Langton Herring and Abbotsbury, about five miles from Weymouth, but time can scarcely be found to include this in our tour; and writing chiefly for Londoners, I shall assume that they can afford to forego the Chalk and Neocomian of the district.

First Day.—This can be best devoted to an examination of the cliffs west of the town, if the tide be low in the morning. Commence at the Nothe promontory, on the west side of which, near the fort, the Oxford Clay can be seen on the shore, and *Gryphæa dilatata* obtained. Damon (pp. 34-9) is here good—giving Sedgwick's list of the beds of the Coral Rag as they crop up successively along the cliff. No. 4, blue argillaceous beds, which is just at the re-entering angle of the coast-line after leaving the Nothe, is the

first I could identify positively. Here the shaly beds should be split up with a knife, as slabs of mollusca are frequent. Proceeding along the shore eastward, the more typical beds of the Coral Rag crop up, hard, irregular, sandy limestone, with many fossils (see Damon's list, pp. 37-8). Ammonites I did not find abundantly, but one or two can be picked up in the morning. At the base of Sandsfoot Castle (a conspicuous ruin), is a prolific spot for fossils, especially Belemnites. West of Sandsfoot Castle the sea has eroded so much as to destroy the section, the sloping turfed cliffs being protected by a sea-wall formed of Coral Rag blocks. Just about here must be the Kimeridge Passage Beds, ably described by Prof. Blake, but I was unable to identify them clearly in the short time available. Further west the cliff rises in a mass of blue clay, still "Passage Beds" I think, and here a patient attack produced an abundance of fossils. [The visitor must not, however, expect to find a tithe of those mentioned in Prof. Blake's exhaustive paper.] These beds pass insensibly into the Kimeridge Clay, which lasts until the cliff ends at the low, sandy isthmus ("Smallmouth Sands") connecting Portland with the mainland, in the lee of the Chesil bank. Leaving this until another day, the visitor, giving a good look at the Coral Rag blocks here forming the seaward embankment of the railway, and which contain many fossils, had better now return by the road to his quarters. Distance, perhaps, not five miles there and back. Time, probably the whole day.

SIDNEY WEBB.

(*To be continued.*)

THE NATURAL HISTORY OF LONDON.

No. 3.—INSECTS IN NORTH LONDON.

I have recorded the following captures of insects by myself or friends, mostly in or near Islington, during the last few years :—

Pieris brassicæ, rare ; *P. rapæ*, common ; *P. napi*, very common ; *Vanessa urticæ*, fairly common in most years ; *V. io*, one specimen in the City, 1879 ; *Chrysophanus Phlæas*, one specimen, 1881 ; *Smerinthus populi*, rather rare, either the caterpillars or imagos may be met with every year ; *Sphinx convolvuli*, three specimens in the Strand 1879 ; *S. tiliæ*, one or two specimens ; *S. ligustri*, rare ;

Macroglossa stellatarum, five specimens, 1875-77 ; *Zeuzera Æsculi*, two specimens, 1872 and 1880 ; *Lignisperda Cassus*, two specimens, 1881, one at Hampstead and the other in the City ; *Acronycta Psi*, fairly common on walls, &c.; *A. megacephala*, rather rare on walls, &c., 1879-81 ; *Hepialus humuli*, common at Camden Town ; *Arctia caja*, occasional ; *Orgyia antiqua*, very common ; *Uropteryx Sambucata*, rather common ; *Rumia cratægata*, common ; *Amphydasis* [or *Biston*] *betularia*, one specimen, 1881 ; *Boarmia rhomboidaria*, rare, 1877 ; *Abraxas grossulariata*, common ; *Melanippe fluctuata*, rather common ; *Pygæra bucephala*, periodically common, 1878; *Halia wavaria*, one specimen, 1881 ; *Mamestra brassicæ*, rather rare, 1879, &c. ; *M. Persicariæ*, fairly common ; *Triphæna Pronuba*, common ; *Euplexia Lucipara*, rare, 1881 ; *Phlogophora meticulosa*, two specimens from North London ; *Agrotis suffusa*, not uncommon ; *Liparis salicus*, one specimen ; *Nœnia Trypica*, rare, one specimen ; *Dicranura Vinula*, rare, one specimen ; *Crocallis Elinguaria*, one specimen from North London.

Among Coleoptera I have found :—

Various species of *Telephorus*, common ; *Coccinella septempunctata*, common in 1879 and 1880 ; *C. bipunctata*, common ; *Clytus arietis*, rare, two specimens, 1881 ; *Creophilus maxillosus*, common.

Of other orders I have met with the May-fly (*Ephemera*), very rare ; *Vespa vulgaris* (wasp), rare ; *Blattus* (cockroach), common ; four kinds of Muscidæ, or flies ; two or three Tipulidæ, or crane-flies, common ; *Culex pipiens* (gnat), common.

Among bees, different Bombi, and *Apis mellifica*, uncommon ; different Ichneumonidæ, rather common ; and various aphides ; of the Cercopidæ, *Aphrophora spumaria*, or frog-hopper, is common ; and, lastly, the earwig is fairly common wherever it should *not* be.

E. H. H.

No. 4.—The Botany of a Piece of Waste Ground.

In a former paper* I pointed out that much might be learnt from a patch of waste ground by any one who would take the trouble to observe what grew there. Patches of waste ground abound in the suburbs of London, and the particular patch from

* "Means and Methods of Observation." Vol. i., p. 21.

which the following plants were collected last summer is situated just without the four mile radius from Charing Cross.

Let the student or lover of nature betake himself to the nearest open space, reserved for building purposes or what not, provided it has been left to itself for a period, and I venture to say that, confining himself even to that single patch of ground, he will find ample material for a whole season's study—I had almost said for many seasons.

For beside the commoner and familiar plants he will be sure to meet with, there will, I doubt not, be found many forms which, if not new to him, he may not fully comprehend the structure and relation of. Now-a-days, too, when so much is being said and written about the particular uses to which the flowers of individual species are put to, how each insect-fertilised flower (and we have been taught that cross-fertilisation is the *rule* of nature, and self-fertilisation the exception) endeavours to adapt itself to the structure of the particular insect which frequents its blossoms, a new zest is given to the pursuit of botanical research. Throwing aside all anthropocentric ideas of creation, we now regard each individual flower as struggling for the propagation of its species, and with this struggle we see the "survival of the fittest" in those plants which have succeeded in adapting themselves most completely to the situation in which they have been placed, or to which they have migrated; and if it be an insect-fertilised flower we find a further and important sign of greater perfection in the more complete adaptation of the structure of the blossom to the size and form of the insect which it seeks to attract in order to secure cross-fertilisation. The *use* of colours, of honey-glands, and of the certain curious forms of corolla which are met with in flowers, are instantly recognised in their true sense, viz., for the good of the plants that possess them alone.

How interesting, when viewed in this light, does the study of the flowers in our patch of waste ground become! Did we attempt to explain their presence there by the idea that they were created for our delight and edification alone, how devoid of interest would their study be; but when we come to look on beauty in the organic world as a thing of *use* to its possessor, and existing independently of us now, as geology reveals to us it existed ages before we appeared on the earth, the case is completely altered, and Nature *lives* indeed!

It would be impossible in this short paper to attempt to enume-

rate even a few of the wonderful instances of the adapting of the structure of the blossom to the use which is required of it by its possessor, but I may refer the reader to an excellent article on the subject in the December number of the "Gentleman's Magazine," by Dr. Andrew Wilson, entitled "The Polity of a Primrose," in which some of these numerous and varied contrivances are set forth and described in detail.

Keeping in mind the important fact that the chief object of both plants and animals is the perpetuation of their species, to ensure which end the numerous and ingenious contrivances which are described in the paper referred to are adapted, the study of plants even in such a limited area as the piece of waste ground before mentioned is highly interesting, and a single season spent in observing carefully the relations which may be found to exist between the forms of the flowers and the insects which are seen to visit them, and the faithful recording of facts so observed, may add considerably to one's previous stock of knowledge respecting this most important subject, if not to that of the scientific world generally.

The plants enumerated in the following list were yielded upon a superficial examination of the patch of waste ground referred to:—*Ranunculus repens*, (note the manner in which this species of buttercup is enabled to spread with rapidity over a large surface of meadow-land by means of its creeping stems or *scions*); *Capsella Bursa-Pastoris* (Shepherd's-Purse), *Turritis glabra*, *Barbarea vulgaris*, *Reseda Luteola*, *Cerastium viscosum*, *Trifolium filiforme*, *T. pratense*, *Cratægus Oxyacantha* (Hawthorn), *Conium maculatum*, *Galium Aparine*, *Leontodon Taraxacum*, *Arctium Lappa*, *Onopordum Acanthium*, *Bidens tripartita*, *Senecio vulgaris*, *S. Jacobæa*, *Bellis perennis*, *Solanum Dulcamara*, *Lamium album*, *Chenopodium Bonus-Henricus*, *C. album*, *Polygonum Persicara*, *P. lapathifolium*, *Rumex Acetosa*, *Urtica dioica*.

The curious corolla of *Lamium album* (Deadnettle) receives special mention in the paper by Dr. Wilson before referred to. In this Dr. Wilson shows that there is "the closest possible correlation between the structure of the flower and the form and size of the insect which fertilises it."

Frank J. Rowbotham.

HINTS ON COMMENCING THE STUDY OF BOTANY.

By Prof. Boulger, F.L.S., F.G.S., F.R.G.S.

(*Continued from Vol. I., p.* 118.)

Many books offer themselves for notice at this stage. Professor Balfour's various popular works (A. and C. Black) are now somewhat out of date. Professor Bentley's Manual (Churchill, 15s.), though re-edited and rich in information on the subject of materia medica, is perhaps too bulky and overburdened with obsolete and synonymous terms. Figuier's "Vegetable World," "revised by an eminent botanist" (Cassells, 7s. 6d.), though an attractive work, containing much interesting popular physiology and descriptions of travel, with many good illustrations, still stands much in need of revision. The same remark applies in a less degree to Mr. Bennett's translation of "Thomé's Structural and Physiological Botany" (Longmans, 6s.), a far better work, splendidly illustrated, following what I may term the continental order, and revised with special reference to the examinations of the London University. It is to be regretted that an excellent epitome of Botanical Geography, included in this volume is entirely based on the ante-evolutionary work of Grisebach, with no reference to the work of Mr. Bentham, Sir Joseph Hooker, and Professor Asa Gray in this branch of the subject. Many of the illustrations are from Le Maout and Decaisne's "Descriptive and Analytical Botany." Dr. Asa Gray, of Harvard, in 1879, issued the first part of the sixth edition of his excellent "Botanical Text Book" (New York: Ivison, Blakeman, Taylor and Co.; London: Macmillan). This volume deals only with Structural Botany, *i.e.*, mainly with external anatomy, and is planned to be followed by three other similar treatises, the first of which is to embrace histology and physoilogy, the second cryptogamic botany, and the third the systematic arrangement of flowering plants. The part already issued is probably the best work on this branch of botany, uniting the clearness and fascination of French, with the thoroughness of German writings, admirably illustrated and brought completely down to date, with numerous select bibliographical references. About the same time appeared the first edition of "An Elementary Text Book of Botany," translated from the German of Dr. K. Prantl by Dr. S. H. Vines (Sonnenschein and Allen, 6s.), which has recently reached its second edition. Designed as an introduction to Sachs'

larger work, this compendious volume is divided into four parts, Morphology (external), Anatomy (or Histology), Physiology and Classification. The illustrations are mainly from Sachs, and, though not put first, much stress is laid on histology. In the part on Classification the Cryptogams come first, and are treated most fully ; whilst the system adopted for flowering plants is unfortunately that of Braun and Sachs, which has little to recommend it, and is unlikely ever to supersede in this country that of De Candolle as modified by Mr. Bentham and Sir Joseph Hooker. The work has, however, I believe, been much modified in the new edition. It is well adapted for the student who seeks University honours or contemplates histological work. As an elementary work it does not give references to authorities. Perhaps on the whole the most satisfactory work for the second year student "of one book" is the third edition of Dr. Masters' "Henfrey's Elementary Course of Botany" (Van Voorst, 1878, 15s.). It is particularly good in the structural and systematic portions, in the latter following Bentham and Hooker, and giving quite enough space to economic products. Perhaps it might with advantage have omitted some of the less important Natural Orders. In the third part histology and physiology are rather confusingly mixed together ; but the work concludes with most valuable epitomes of Geographical and Geological Botany.

(*To be continued.*)

SOCIETIES' MEETINGS.

"On Lakes and their Origin."—Under this title, Prof. P. M. Duncan, F.R.S., read a very interesting and important paper at the last meeting (Jan. 6th) of the Geologists' Association.

Starting with the general proposition that glacial-action had nothing whatever to do with the excavation of lake-basins, the Author proceeded to show that they were, in the majority of cases, pre-existing depressions in the land-surface originating in subaërial erosion, faulting, &c., that had at one time even been occupied by the sea, as evidenced by the modified marine type of animals still found dwelling in their depths.

Hitherto this biological evidence of the antiquity of lake-basins has been over-looked by geologists in endeavouring satisfactorily to account for their formation.

With regard to the great lakes of N. America, Dr. Duncan ex-

hibited sections which showed them to contain huge cañons without drift, like those now extant in the Western States, but which had been subsequently depressed, and filled with water that at one time certainly was salt.

The great depth, sometimes below sea-level, of the larger lake-basins, was attributed by Dr. Duncan to lateral movements of the earth's crust, which had contracted their area, and at the same time deepened them. He stated that the rivers running through lakes would not erode them, and that at the depth of a few scores of fathoms the sea does not erode.

NOTES AND QUERIES.

The Diseases of Corn.—In the January number of your excellent periodical there is an interesting paper on this subject.

I was rather startled to see the disease called Ergot attributed to the puncture of an insect. This seems to me to be a mistake, as all the authorities I know on the subject state that it is caused by a special fungus attacking the plant.

I cordially agree with the other statements of the author, but would ask him to give his authority about the Ergot if he thinks I am wrong.

Ealing, Jan. 2nd. Geo. D. Brown, M.R.C.S., F.L.S.

Entomological Notes.—A very good specimen of a small tortoiseshell butterfly *(Urticæ)* was taken here on the 4th of January. Is this not an unusually early appearance?

Can any of your readers explain the difference in the marking of the male and female Red Admirals *(Atalanta)*, and how to distinguish them? Or whether it is correct to call those with a small spot in the red band of the upper wing the female, and those without the spot the male?

Cobham, Surrey. Arch. Seth Smith.

Tree-frogs.—In reply to G. W. Bradshaw. Having kept tree-frogs for many years, I find that in winter they will feed on cock-roaches more readily than anything else. Kept in a fern case and in a warm room they do not hybernate, the bulls croaking at night as in spring. Wilfred W. O. Beveridge.

Note.—If a receipt for subscription be required at once a postage stamp must be sent for the purpose, otherwise the receipt will be enclosed in the next number of the magazine.

NATURAL HISTORY NOTES.

EDITED BY FRANK J. ROWBOTHAM,

(Memb. Geol. Assoc. of Lond.)

VOL. II. MARCH, 1882. No. 3.

EVOLUTION, CONSIDERED IN REFERENCE TO THE MARSUPIALIA.

BY W. H. DAVIS *(Pres. Met. Sci. Assoc.)*

(Continued from p. 15.)

The distinctive characters of the whole Mammalian class are summed up in their mode of development and nourishment during the earliest period of life. They are viviparous: and in each of the various orders composing the class we find similar provisions for nourishing the animal during the period immediately succeeding its birth, by means of mammary glands—the number and position varying in the different groups. Leaving aside the Marsupials, these varying orders are separated from each other on diverse grounds of organization, as Carnivora, Probiscidea, Artiodactyla, Quadrumana, &c., in which the food, the possession of a trunk, the number of toes (even or odd), and the number of hands, are, as examples, the bases on which rest the different groups of this class,—these particular differences necessarily being combined with other varieties of structure peculiar to each group, as in a carnivorous animal a special dental formula accompanies it, differing from that of a ruminant or even an insectivorous animal; this in turn by a less complex stomach and by organs of prehension more or less adapted to the peculiarities of its mode of living. Thus we understand that between the one group and another of the Mammalian class there are broad dividing lines, not always of equal value or power, based sometimes on a single characteristic (usually the most important one), this in its turn carrying with it many other structural modifications and peculiarities. We cannot represent the class by a single straight line divided into an equal number of parts or divisions corresponding to the number of orders, each division being of

precisely the same length as the other; but rather by a circle, representing the class, filled with a number of divisions of irregular and varying sizes corresponding to the importance of the different groups.

With the Marsupialia the case is far otherwise. They are not a group or order like the Carnivora; they are not a group or order like the Insectivora; they are not a group or order like the Ruminantia; but they are, as Marsupials, a combination of the whole of these and other groups or orders. "Some are arboreal; some are burrowing; some flit through the air; while others range over and graze upon grassy plains; some feed on vegetable food; others are as exclusively insectivorous or carnivorous; some are aquatic; others terrestrial, and their teeth, stomach, and structure vary in accordance with their separate characters." In size the differences are extreme; there is one form (*Acrobata Pygmea*) so minute that a pill-box gives ample room for its nest, whilst the Diprotodon exceeded in bulk the hugest rhinoceros. The one and only bond of union is their Marsupiality. Let us see of what this Marsupiality consists.

In both sexes are two supplementary bones, enclosed with the flesh, and joined to the anterior portion of the pelvis. By a fold of the abdominal skin, a pouch is formed in the female, supported by these bones, the pouch covering the mammæ; in the males these bones support the testes. Both sexes present very remarkable peculiarities in their genital organs, differing from all the other mammalian orders. The young are produced without the presence of a placenta, and brought forth imperfectly developed.

The osteological structure and dental characters vary in the respective genera, according to the varying habits referred to, but there is one almost constant character in the whole group, viz., an inflection of the extremity of the lower jaw where it joins to the skull. The presence of this is alone sufficient to define a Marsupial where found. The bones of the skull remain longer separate than in other animals, and do not anchylose,—a character common to the Reptilia. Superadded to these differences are variations in the internal organization of the brain, &c., and, as just mentioned, of the procreative organs.

Referring now to the accompanying classification of this order, let us observe and take note of the changeful aspects under which the genera composing it are presented to our view.

The first are the Monotremes—beaked forms, with bird-like characters. Then succeeds the Didelphia, divided into Herbivorous and Carnivorous groups, the former containing Hoofed, Leaping, Gnawing, and Climbing forms; the latter including Rapacious, Insectivorous, Trunked, and Ape-footed forms. These, the genera of the Marsupial order, may each be considered the homologue of one of the Mammalian orders, the divisions in one running parallel with the groups of the other.

Evolution endeavours to account for diversity of structural form and characters by referring the variations back to a prototypical or original ancestor. Where complete unity of characters exists in any two forms, it is readily conceivable that the unity of origin necessarily follows, and, on the whole, subject to a few remarkable exceptions, it may be assumed that the more important and more numerous the ties that similarly bind two groups together, the nearer the relationship that exists between them. On this view of the case, in the whole series of Mammals there exists the important and single bond of Mammaliality (if we may use the term) only, but in the Marsupials there is throughout the whole group a *double* bond of union; for, in addition to this Mammaliality possessed in common with the other orders, it also contains the bond of Marsupiality. The leading characters of this have already been notified, and it is indeed the result of the physical and physiological importance of these two characters in the animal economy that has enabled their unity to be continued and maintained under such extensive and varied structural differences as have obtained, and are observable in the various genera of Marsupials.

On a theory of descent by variation, we should expect to find the higher forms taking their origin from the lower groups—the mammal or placental series, from the marsupial or implacentals. This might occur in two ways: 1st, each division of the implacental series branching off into a corresponding series of the Mammalian, the Hoofed forms of the one into the Hoofed forms of the other, the Insectivorous into the Insectivorous, and so on; or the variation may have taken place by a separation of the one and lower form into two divisions, at some early period in its history, and these two divisions, each separately and independently of the other, continued their progress in the evolutionary direction. That this latter condition may have been the true state

of the case, I am inclined to believe is probable, and we shall find that at some period near the close of the Secondary Epoch the Placental forms took their origin from some branch of the Marsupials, and the two co-existed—the latter being ultimately restricted to one portion of the earth's surface, over the whole of which it had formerly reigned supreme, and the newer offshoot (the Placental forms) supplanted it.

On the other hand, there are many weighty reasons, when the details of the Placental group are considered, for believing that the process of development from a Marsupial form has occurred more than once in the history of the class. There is indeed but little doubt as to the origin of the higher forms of Placental animals from the lower Marsupial types, but from the differing modes of Placentation, &c., in the higher group there are sufficient grounds for believing that more than one offshoot from the Marsupials has occurred.

This is indeed a most remarkable circumstance, for here at the present moment are existing two important series that have independently of the other passed through a variety of modifications, and in the one group the equivalent modification of the other is discernible. This field has not yet been carefully surveyed ; and it will doubtless repay a far closer scrutiny than has hitherto been devoted to it, to trace how far a similar order of advancement has been observed in the Marsupial and Placental series, and to discover the missing forms in one or the other series as evidenced by the proofs of their existence in the remaining one. Taking the view just propounded as to the common origin of the Placental and Implacental series, we should expect to find structural and functional relations assimilating the two groups ; and these are indeed present.

The first on our list—the Ornithodelphia or Monotremes—are indeed as exceptional a collection of forms as are known to exist on the globe. They consist of three species only, two Echidnas, and the other the well-known Ornithorhyncus ; they have frequently been described since the first accounts of them in 1792 and 1799, and it was a long time ere their correct place in the animal series was understood and appreciated—their remarkable combination of characters at one time requiring them to be recognised as companions of one series of forms, at another time to be relegated to other groups. It need hardly be mentioned that at that period

Palæontology had not brought to light those varied forms of birds with teeth, and birds with reptilian characters strongly developed (the now well-known Ornithosauria), or the strangeness of the group, though not less wonderful than it is, would not have been productive of so much difficulty to naturalists.

(To be continued.)

AT WEYMOUTH FOR FOSSILS.*

(Concluded from page 18.)

Second Day.—If the tide be low, proceed along the shore eastward. Just outside the town, below a public garden ("Greenhill Gardens," Damon, pp. 30-1), the Oxford Clay is seen, forming tho low cliff. Here the selenite can be best picked up, and *Gryphæa dilatata* and *Ostrea* are abundant. On the shore between this point and a little rivulet (known, I believe, as the "Jordan"), is the best place for obtaining large *Gryphæas* and slabs containing *Ostrea Marshii*. "On the other side of Jordan," the cliffs rise in great hills, Jordan Cliff, Ham Cliff, &c. The visitor will, I think, find it more convenient and more healthy to mount and proceed to Osmington along the cliffs—not attempting to "shirk" the hills by so-called short cuts. (*Experientia docet.*) He will see in the distance the white chalk cliffs of White Nore, but had better descend at what seems to be lowest part of the cliff, *past* Osmington Mills and Cascade some half-a-mile. Here he will find himself at nearly the bottom of the Coral Rag (Bed No. 6 of Damon, p. 42) at a very prolific spot for fossils, *Nucleolites scutatus*, *Chemnitzia Heddingtonensis*, and *Trigonia clavellata* being especially abundant. He will then walk westward along the shore, passing in succession the various beds of the Coral Rag (pp. 41-5 of Damon), noticing especially the *Trigonia* blocks, crammed with these fossils. The "Kimmeridge Clay" presently forms the cliff, and from this point to the "Jordan," the Oxford Clay and Kimmeridge Clay appear to alternate through faulting, in a most perplexing manner (Damon, p. 148).

I was unable to give any time here, but it did not appear at all fossiliferous, although Damon (pp. 26-27, and 30) promises much. This is a heavy geological day's work, perhaps nine miles in all,

* We are indebted to Mr. Damon's Handbook for the out line-map which appeared in our last number.—Ed.

and dinner had better not be ordered for any particular hour in the evening.

Third Day.—The visitor will by this time want to go to Portland. He had better take the train (8.35 a.m., I think it is, is the most convenient one for a *worker*), which lands him in the little town of Chesilton, where the famous beach joins the island. Turning his back, however, on the beach, he should proceed through the town to the right, to the west side of the island, and just where the houses end he will see a yellow sandy cliff, which Prof. Prestwich calls "ancient land *débris*." It is a curious deposit, but I did not find any fossils, though Prof. Prestwich describes some fresh-water mollusca from it. The visitor should then scramble over the millions of blocks of Portland Stone which he will find forming a talus to the cliff, owing to the habit of the quarry-workers of shooting all the worthless stone in a petreous cataract over the edge. This will probably puzzle the future geologist.

Many fossils are to be found in these blocks, and by the time the visitor has tired of spoiling his boots on their edges, he will, by keeping close to the cliff, have reached a dark, sandy stratum conspicuous in its side. Some small fossils were found here, and I considered it to be the section of Portland Sand described by Prof. Blake. Just past this, an alpine path leads to the top of the cliff, and the visitor will do well to mount, and then proceed along the edge of the cliff southward to the "Bill." After passing the first lighthouse, where the turf ceases, he will easily make out the "raised beach" described by Prestwich, which should be examined to the east of the "Bill." By this time, the visitor will be somewhat tired, and will probably feel he should like to sit down. He may do so, but had better turn homeward, by beach or by road, without stopping for the quarries to-day. He will certainly have to wait for a train back, and can thus give a few minutes to a contemplation of the Chesil Bank, stretching for eleven miles to the north-west. Distance of the day's tramp probably eight or nine miles, taking the whole day.

Fourth Day.—A wet day can be devoted to a call at Mr. Damon's "museum" (situated at the Bellevue Auction Rooms). If the visitor calls about 3 p.m., he will probably find Mr. Damon or his son present, and will undoubtedly be courteously received, and shown an enormous quantity of Natural History specimens of all kinds in picturesque and crowded confusion. Note especially the Trigonia-slabs and the polished Septaria tables. The morning

can be devoted to "frivolity," if the visitor be exhausted by hard labour at Portland. (A mild kind would be to examine the beach from Sandsfoot Castle to the isthmus for shells. Weymouth offers an abundance of species, and this seems the best locality.) Or, if the Backwater be crossed by the curious pile bridge, the muddy beach on the western shore just to the north of the bridge, offers an abundance of small pyritised Ammonites in the Oxford Clay. (And as Ammonites are elsewhere not very abundant, the visitor had better visit this place, which is, however, dirty.)

Fifth Day.—As a preparation for Portland quarries, those of Upwey should be visited. Take an early train to Upwey, and proceed northward through the village towards the conspicuous range of hills. Close to the station is a Kimmeridge Clay brick-field, which should be noticed. There are half-a-dozen quarries, one above the other, commencing with Portland Stone and ending with Purbeck. All should be carefully examined, and Prof. Blake's paper will be found an admirable guide. Get slabs of Cyclas and Cypris from the Purbeck. Valuable finds of palatal teeth of fishes are sometimes made in the first Portland Stone quarry (see Blake). If the visitor cares to trespass on the railway, just before the entrance to the Ridgway tunnel, he can find evidence of the great Ridgway fault by scratching up a small piece of turf here and there (Damon, pp. 21-2, 50-1, 146-7). Returning through the village, he should turn off to the west, passing the church and a watermill, towards the village of Corton (pronounced *Kaarrt'n*), leaving another Purbeck quarry on his right hand. In this direction, about three miles from Upwey quarries, in the parish of Corton, is a road cutting (Damon, p. 75), leading from the Dorchester road down a steep incline to a large poultry-house. This cutting is in the Portland Sand, but the fossils, though numerous, are chiefly very distorted casts only. Return to Upwey station, and thence by train. Distance walked, seven or eight miles. Time, the whole day.

Sixth Day.—Take the train to Portland, and turn to the left after leaving the station, along a road running apparently to the steamboat-pier. Leave this road by leaping the stone wall on its right hand side, and trespass southward across the meadows, keeping about half-way between the Vern Fort on the top and the shore-level, and crossing by the way the peculiar inclined tramway. Just past this, at the foot of the Vern, is another of the talus heaps before mentioned, and this I found the most prolific place

for Portland fossils. The visitor will then mount to the path round the edge of the Vern, and proceed southward until stopped by a warder, when he will be compelled to retrace his steps, until, still skirting the Vern, he comes again to the cross-roads where he diverged to the left in the morning. Now ascend the main centre road, which leads through the middle of the quarries (Damon, pp. 75-100), wherein the visitor can spend as much time as daylight will allow, returning to Weymouth by train.

Seventh Day.—Walk out of the town by the Dorchester road, to the village of Broadwey, about two miles. Just past this, notice on the right a straight cutting at right angles to the road. This is part of an abortive railway scheme, and serves to expose a section of Coral Rag, where some time should be spent. The quarried blocks are especially rich in fossils, *Nerinea Goodhallii* being very plentiful. A way should then be found to the village of Radipole, at the end of the Backwater, and to the water-mill there. Enquiry of the miller will lead to the discovery, in a field above the mill, of a place, now nearly grassed over, where there was once a pit opened in the Forest Marble (Damon, p. 14). *Terebratula digona*, and *intermedia*, and *Rhynconella concinna*, and *varians* may still be found there. I was not able to find a better exposure of this formation anywhere near. If the stream working the mill be now followed to its mouth, and the shore of the Backwater then traced to just where this body of water becomes broad, a very good section of the Cornbrash is found in the low cliff here, facing Weymouth (Damon, pp. 17-20). The beach is strewn with the fossils given in Damon's list. The bed of the Backwater from hence seaward is Oxford Clay, but is rarely sufficiently exposed to allow of fossils being obtained, except at the point before mentioned on the west shore, just north of the pile footbridge.

This completes the week's work, and the visitor will have been unfortunate if he has not by this time obtained some idea of the stratigraphy of the district, besides as many fossils as will make the railway porters stare at the weight of his packages. But it is not pretended to set forth in these hints the *best possible* distribution of time, to do which would require local knowledge, and if the visitor can possibly give the district another week he will doubtless discover many additional places of interest.

The sections mentioned by Damon at pp. 15, 19 (the first and last), 22, 29, 31, 46, and 69 are grassed over, or otherwise un-

available. If the present pages serve to prevent loss of time in searching for these, and to give some idea of where to go when at Weymouth, the author, writing as a student to students, will be gratified at his notes having thereby attained their end.

SIDNEY WEBB.

HINTS ON COMMENCING THE STUDY OF BOTANY.

By Prof. Boulger, F.L.S., F.G.S., F.R.G.S.

(*Continued from p.* 23.)

During the spring, then, of his second year, the tyro (having mastered the first part of Oliver), being able to examine a great variety of forms, had better confine his attention to Morphology, Comparative Anatomy, or Structural Botany, in the first part (157 pages) of Henfrey, if a general or medical student; in the first part of Prantl, if a University candidate pressed for time; or in Asa Gray, if not afraid of reading. In the summer he must continue to dissect flowers when he can get them, and will require to devote some attention to their classification; but much of his time must be given to minute anatomy or histology, and to physiology. Here, of course, he will find it useful to have studied "How Crops Grow" during the previous year, but now he will do well to work with the second and third parts of Prantl, or with Part III. of Henfrey. In the latter case he may, in this first perusal, confine himself to the large type. For the athletic student we are promised a special treatise on Vegetable Physiology by Dr. Vines, than whom no Englishman is better acquainted with the experimental methods and results of continental work.

At this stage the pocket lens, which was all that was needed for floral dissections, must be supplemented by work with the compound microscope. For general botanical work there is, I believe, no instrument so generally useful as Hartnack's ten-guinea microscope. Messrs. Tisley and Spiller are the London agents for these instruments, but any other make with a 1-inch and $\frac{1}{4}$-inch power will do well enough, at all events at first. The student need not trouble himself with mounting microscopic specimens, and will, in fact, want but little skill in manipulation. Section-cutting, however, and drawing, either with or without the camera-lucida, are valuable acquirements. Actual examination of specimens of his own preparation should render the student familiar with the *cyclosis* in the leaves of Vallisneria or the hairs of Tradescantia, the appear-

ance of pollen-grains, the protrusion of the pollen-tube, the cuticle, epiderm, hairs, stomates, palisade-cells, and spiral vessels in ordinary leaves, the sieve-tubes in cucurbita, the pits of Pinus, the scalariform vessels in ferns, starch-grains and aleurone-particles in potato, maize, and peas; the stellate cells in the mesophyll of rushes, the root-cap in duckweed, and similar objects. It is advisable as far as possible to use the clear daylight of a summer day for microscopic work, and not to risk damage to the eyesight by over-illumination, especially that of the wide field obtained by not using a diaphragm.

During the summer vacation, in July or August, while not losing opportunities for the study of new forms, and the life as well as the structure of flowering plants, the morphology and physiology may be well revised with Professor Bentley's shilling manual of Elementary Botany (S.P.C.K.), or, better still, especially after the study of Prantl, with Professor McNab's Outlines of Morphology and Physiology (Longmans' London Science Class Books, 1s. 6d.), a highly condensed introduction to Sachs.

Before the time of this holiday task, however, the study of Systematic Botany must have been begun, and here again industry during the first year in learning the second part of Oliver will save much subsequent labour. With the exception of the Tea and Palm tribes, Professor Oliver confines himself to orders represented by British plants, and, as these are the most easily accessible, this is advisable, but many common garden flowers belong to other orders. Students intending to visit or reside in India can use Professor Oliver's "First Book of Indian Botany" (Macmillan, 6s. 6d.), which is, in fact, his Elementary Lessons with illustrations and orders representing the Flora of that country. In any case, it will be well to study chapters I. and II. in the second part of Henfrey, pp. 158-195, on the principles and systems of classification.

(*To be continued.*)

PALÆOLITHIC REMAINS AT WEST WICKHAM, KENT.

Perhaps it may interest some readers of this journal to know that I have lately found several Palæolithic wrought flints at Church Field, West Wickham, Kent, in addition to those previously described in these pages.* They consist of almond-shaped

* *Vide* "Nat. Hist. Notes," 1881, p. 61, *et. seq.*

weapons, scrapers, flakes, and one large core or nucleus, and were all obtained from the same part of the field as the others which I have referred to above. With the exception of two specimens of almond-shaped weapons, the two groups of flints seem to have very much the same appearance. These two particular specimens have a more triangular outline than the others; one of them is quite perfect, having the point unbroken, and is in every respect the finest specimen of a Palæolithic weapon which it has ever been my lot to find.*

This discovery strengthens the conclusions at which I had previously arrived, and, from careful examination of all available evidence, I am led to believe that the wrought flints have not been drifted to Church Field, but are found in very much the same position as that in which they were left by their former possessors, although a small movement must, of course, have taken place whenever the field has been ploughed; and I think that there can be little, if any, question that the area in which these flints were found marks the site of human habitations.

I may add that Charles Roach Smith, Esq., F.S.A., &c., an authority on these matters, ascribes a very great age to the primitive tools and weapons which I have found at Church Field.

West Wickham, Kent. GEO. CLINCH.

NOTES AND QUERIES.

LYCHNIS VISCARIA.—Mr. Harris Stone recently exhibited at the Linnæan Society a dried plant of the so-called German Catchfly (*Lychnis viscaria*), which he discovered growing in isolated situations in Norway at elevations of about 1,000 feet above sea-level. The stem of this plant pours out a sticky glue-like secretion, which caused ants and other small insects to adhere to it and die. The insects rarely succeeded in gaining the summit of the stalk, which is surmounted by a flower. What purpose the plant gains by this secretion, so specially fatal to ants, has not yet been positively determined.

BUTTERFLIES AND MOTHS AT SEA.—I had been staying at Madeira, and was returning to England in one of the British and African Line steamships. We were coming up St. George's Channel on a warm misty morning, and were out of sight of land,

* I shall be happy to forward a sketch of this weapon to any one who desires it, on receipt of stamped and addressed envelope.

when I perceived a large number of Lepidopterous insects, *Cynthia cardui*, *Plusia gamma*, *Stenopterys Hybridalis*, and others, which were flying round the steamer, and crawling about on the deck.

T. D. A. C.

Tree-Frogs.—I have found tree-frogs willing enough to eat cockroaches, of which most folks have a too-abundant supply.

N. M.

"Imperfections in Nature."—Could not Prof. Boulger suggest some improvements on the faults which he has to find with the economy of Nature? If nothing died where would he find room for all the animals? What would he feed the carnivora on?

E. H. H.

Flint Implements.—W. H. Ince writes us asserting that "no date can be assigned to Flint Implements;" in proof of which he states that "in the same strata two totally different forms of Flint Implements" are found, the conclusion drawn from their difference being that they belong to distinct flint periods. This conclusion, however, he thinks, is by no means quite correct, for he believes that the differences of character observable between the two implements so found may be accounted for by variations in workmanship in an implement made at leisure and one made by the same individual in haste, on an emergency like that of war. We would advise, if he has not yet done so, the perusal of the writings of Boyd Dawkins, John Evans, and Pengelly upon the subject.

To Correspondents.—Will our correspondents kindly bear in mind that their communications should be as concise as possible, and written legibly on one side of the paper only. They will also save a deal of trouble if they will write all *scientific* names clearly and correctly.—*Miss E. Bradley*: (1). The bottle presumably would come up just as it went down, free from sea-water but with the water it contained when sunk still remaining. In no case could it come up either empty (vacuum) or filled with air, even if the cork were pushed in by pressure. (2). Yes, *if* the pressure be sufficient to push in the cork, but not otherwise. *T. D. A. C. (Chislehurst).*—Thanks; in our next. *A. Hollick.*—Thanks for suggestion. *Mrs. M.*—For want of space we are obliged to defer your contribution, and many others which we have received, till the next number. The magazine, however, will, it is hoped, be shortly enlarged, when more space will be at the disposal of our correspondents.

NATURAL HISTORY NOTES.

EDITED BY FRANK J. ROWBOTHAM,

(Memb. Geol. Assoc. of Lond.)

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THE ESTABLISHING AND MANAGEMENT OF MARINE AQUARIA.

BY J. W. WORSTER, L.D.S.

Perhaps the study of Zoology has never received a greater stimulus than since the introduction of Public Aquaria; certainly that branch of it which has for its object the study of the life-history of those creatures which are seldom seen above low-water mark has never before been so thoroughly worked out, and even many other branches which were formerly considered fully explained are now so altered or modified that little remains of their original character.

To the Embryologist the keeping of aquaria produces a ready means of prosecuting his researches which he would otherwise be quite unable to obtain except from the few chances which occasionally present themselves, and the benefits to be derived from the observation in one's own home of many of those hidden processes of nature it is impossible to over-estimate. Of course the larger the aquarium the greater will be the advantages derived, and where practicable it should be sufficiently extensive to allow of an attempt being made to carry out a system of circulation. But it is, indeed, astonishing how many of the beauties of Nature can be seen and studied in a few gallons of sea-water properly arranged. Many experiments have been tried, and many forms of tank recommended, but that which most of all commends itself is an oblong rectangle in shape, either of wood or slate, having one of its sides made of plate-glass. The light should not enter it except from above, and then obliquely in preference to vertically. Another point which materially tends to success is to have one part of the tank kept in darkness; this is useful for several reasons, the prin-

cipal of which is that it helps to keep down the growth of infusorial life, which would otherwise increase to such an extent as to make the water almost opaque. If, therefore, one part of the tank be kept in perpetual darkness, the multiplication of these creatures is there retarded, as light is necessary to their development, so that if we can arrange that the water which is exposed to the light be systematically changed to the dark chambers, it will there be purified by the death of its infusoria, and will also keep at a lower temperature.

Such an arrangement is easily brought about by having a false bottom to the tank, made of slate, which slopes from the bottom upwards to within about three inches of the water-line at the back, giving, of course, the full depth in front. This slate keeps the water beneath it constantly dark, but it is advisable to have plenty of holes in or around the sides in order that the water contained beneath it may readily circulate upwards. To facilitate this change a tube connected with a double-action bellows should be carried down one of the back corners, brought across the floor diagonally under the slate, then emerging from beneath turn round and continue a short distance parallel with the glass front.

This tube may be either of glass or gutta-percha, but I have found the ordinary composition-pipe of gas-fitters answer best. Care must be taken, however, to cover all exposed surfaces of metal with some varnish insoluble in water, otherwise the lead might act injuriously. Shellac dissolved in alcohol is the best to use for the inside, and the outside can be done with pitch. The end of the tube should be soldered up, or closed in some way, and then a series of minute holes drilled at intervals of a few inches, so that when a continuous stream of air is driven through it will escape at these several places in the shape of little bubbles, which, in rising to the surface, will create an agitation in the water, and so induce a circulation. After having become quite certain that the tank is water-tight, and that the tube is in good working order, the slanting slate may be lodged on the bottom against a little ledge, and allowed to rest against the back on a similar ledge. The upper surface is then to be covered with stones or rockwork, placed according to fancy. In covering the sides and bottom with rockwork it is advisable, as far as possible, to avoid having any inaccessible holes or crevices, as small animals on the approach of death invariably retire to some dark corner in which to "shake off this

mortal coil," and then if it be impossible to get at them they soon make the water cloudy and offensive, to the great injury of the other inmates. Pitch is a very good material with which to fasten down the stones, but it should have rosin melted with it in the proportion of 2 of pitch to 1 of rosin. Portland Cement may be used, but it is necessary to wash it thoroughly with several waters after it has hardened, in order to prevent the excess of lime with which the water would otherwise be charged.

When the tank is completed, and ready for its inhabitants, fill it with sea-water, and place therein some few pieces of weed attached by their roots to fragments of stone, and allow them to remain for a week or two before adding the live-stock. In fact, if patience will permit, it is much better to wait until confervæ begin to grow spontaneously upon the rockwork, as it is of the utmost importance to have the vegetation in a healthy growing condition. Moreover, it is indispensable to the health and comfort of the inmates that the same conditions should be fulfilled that obtain in their natural habitat the sea.

Of all sea-weeds none are so useful for oxygenizing the water as that broad, thin-leafed plant, the *Ulva latissima*, or "Sea-lettuce," as it is popularly called. Of course it is possible to keep animals in a healthy condition in water in which there is little or no weed, as for instance is done in our Public Aquaria; the necessary oxygen is there brought to the animals by forcing a small jet of water into each tank, which in its descent carries with it numberless beads of air, thus bringing the oxygen of the atmosphere intimately into contact with the water by which it is absorbed to a large extent. So far for the one condition. But how about getting rid of the carbonic acid which is being produced by the animal population of the tank? To a certain extent this is accomplished by a chemical change. In all sea-water there is a certain percentage of lime, and the carbonic acid unites with the lime, forming a new compound—carbonate of lime—which in its turn is utilized by all shell-bearing fish, molluscs, crustaceans, &c., in the formation of their external coverings. Thus we can dispense with the weed to a great extent for the main supply of oxygen for our animals, but it is wise to occasionally put in a few pieces, for there are certain subtle elements, such as bromine and iodine, which it gives off, and which are not so easily obtainable from other sources.

A very good plan, whenever one gets the chance of a run to the sea-side, is to bring home a few handfuls of weed, and rinse it well in the water of the tank, for there are sure to be spores and germs of plants, and the ova of minute creatures, adhering to the leaves, which are thus washed off and germinate in the tank, to the great delight of its microscopical owner.

It is essential that the water of an aquarium should always be kept at the same density or saltness, for, as evaporation takes place, the water gets salter. The specific gravity of sea-water is about 1·027, though this varies within certain limits, according to the locality from which the water is taken ; for instance, the Mediterranean is less salt, having a specific gravity of 1·025. Various contrivances are used to keep the water at a uniform density, but the simplest and best can be bought at most opticians' for a mere trifle, and consist of two small glass balls with short stems. They are called specific gravity bulbs ; one of them is weighted to 1·026, and the other 1·027, so that in water at the normal density one floats on the surface and the other remains at the bottom. Should the water get too salt from evaporation, the bulb at the bottom rises and remains on the surface, whilst if too much fresh water be added (I use the term fresh in contradistinction to salt), the one which normally should float sinks. Thus with an occasional addition of a few quarts of fresh-water the proper density can always be maintained. Now-a-days little difficulty is experienced in obtaining good sea-water at an exceedingly small cost, but years ago it was no easy matter, and in 1854 Mr. P. H. Gosse turned his attention to manufacturing it artificially, and his attempts were crowned with success. The composition of his sea-water was as follows :—

Common Table Salt	3½ oz.
Epsom Salts	¼ oz.
Chloride Magnesium	200 grs.
Chloride Potassium	40 ,,
Water	1 gall.

Now for a few words about those creatures which are the most interesting and easiest to keep in a state of health. Naturally the anemones stand pre-eminent. Of these many species can readily be obtained at most of our watering-places, and some of them live very well indeed in confinement. The commonest of all—*Actinia*

mesembryanthemum—is a hardy little fellow, found on nearly every beach, either attached to the rocks or the groynes, or even the pillars of a pier between high and low-water mark. It may be taken as a type of the rest, and may be described as cylindrical in form, having two discs. The lower one by which it attaches itself to its resting place, is muscular and generally large and distinct. The upper one is smaller, and bears the tentacles, which are arranged in rows or concentric circles, in the centre of which the mouth is situated. The tentacles are often of brilliant colours, and consist of contractile and retractile tubes, perforated at the extremity by a minute opening through which the animal can eject streams of water at will. The mouth performs a variety of functions; it is the only inlet for food, and at the same time the sole outlet for all rejected and excrementitious matter; and it also serves the purposes of accouchement. There are two ways in which reproduction takes place. In the first the young are brought forth alive, being ejected from the mouth as above mentioned; and in the second the young are developed from little bud-like excrescences, which are occasionally found upon the edge of the lower disc. These buds are transformed into embryos, which detach themselves from the parent, and ultimately become capable of carrying on a separate existence. Another and very singular mode of reproduction was first observed by Mr. Hogg. This gentleman wishing to detach an anemone from the aquarium, used every effort to effect his purpose, but only succeeded after violent exertions in tearing the lower disc of the animal. Six portions remained attached to the glass, and at the end of eight days attempts were again made to detach these fragments, but it was observed with much surprise that they shrank from the touch and contracted themselves. Each fragment soon became crowned with a little row of tentacles, and finally became a new anemone, while the mutilated parent continued to live as if nothing had happened.

The Daisy (*Sagartia Bellis*) is one of the best anemones to keep, wanting very little attention indeed, but requiring a depth of about two inches of sand, as it always attaches its lower disc to some stone beneath the surface, and only allows the upper one to be exposed. It has then the appearance of a funnel, the rim of which is fringed with tentaculæ, the mouth of the creature of course being in the centre. The most majestic of all anemones, and one which keeps well in an aquarium, is doubtless the *Actinoloba*

Dianthus. These anemones, however, are not often found on our coasts, as they prefer deep water, and to obtain specimens it is necessary to resort to the dredge.

(*To be continued.*)

ON THE OCCURRENCE OF *ACHATINA ACICULA* AT EALING, MIDDLESEX.

I have lately found in this neighbourhood (Ealing) some specimens of the burrowing mollusc, *Achatina acicula.* It is spoken of in "Turton's Manual of British Land and Freshwater Shells" (1857) as being common in Yorkshire, and I am told it has been lately found in Essex; but as I am not aware that there has hitherto been published any statement of its occurrence in Middlesex, I venture to ask you to give me a place in your valuable NOTES to record that it has been found here.

Shells of the above-named species were collected by me in November or December, 1881, in a cutting of the extension to Hounslow of the Metropolitan District Railway, about a furlong S.W. of the old Parish Church of Ealing. The depth below the surface was about ten inches. All the shells were dead. One of them contained an egg. The eggs of this species are large, as compared with the size of the present shell, and in this case the egg was of such size as to fill the outer turn of the shell near the orifice.

GEO. D. BROWN.

FLINT-TREASURES.

BY THE REV. A. N. MALAN, M.A.

Those who, like the Priest of Apollo, love to commune with Nature on the shore of the loud-roaring sea, may find a most interesting object in searching for the treasures that lie hidden in flints. Sponges and corals, crystallised in exquisite beauty; dazzling gems of spar, sea-urchins with each delicate spine perfectly preserved in petrified wood, and other varieties of organic remains, are to be found imperishably embalmed and locked in the flint-nodules so common on many parts of our English coast. Wondrous products of the chalk strata, these flint-nodules are full of

interest and mystery. I remember my first introduction to them. While spending an Easter holiday at Eastbourne, I found amusement and exercise in excavating nuggets of iron-sulphate from the face of the cliff. These, when cleansed of chalk and limestone by dilute acid, are handsome specimens for a mineral collection.

Well, I was under Beachy Head one afternoon, intent on this pursuit, when the familiar sounds of a hammer fell on my ear, and I saw a man in the distance hammering stones which he picked up at intervals among the rocks. He seemed in earnest, and when I approached him, and asked what he was looking for, he replied, "Gems of the ocean, sir!" I talked to him for some time, and watched him select likely-looking nodules of flint, tossing them over dexterously in his hand, and eyeing them carefully as if to gauge their probable value as houses of treasure. He would hold a promising stone on his knee, and smash off projecting knobs with the hammer. Many were rejected after the first knock; but at last he found a specimen, a beautiful pearl-grey sponge, lying like a crystallised fruit encased in flint. He gave it to me, and instantly my fervour was aroused. What were iron-sulphates in comparison with such a jewel? I, too, would search for such glorious rewards! Several thousand flints have I attacked since that afternoon, and a cabinet of fine specimens is the heritage—things of beauty, joys for ever, on which the eye can never weary of feasting. Given a week's holiday at any time of the year, and the hunting-grounds are always open. No season is amiss; wherever there is a beach with flints, there the enthusiast may revel.

A few words about my finest specimen. It was a hot summer day; I had walked to the top of Beachy Head to enjoy the wind, and down its steep slopes to return by the shore. I had no other implement but an umbrella, and no intention of mineralogical research, for the tide was up, and little is to be found except at low water. A jump for the last five feet sent me clattering into the pebbles, and three strides brought me to the edge of the sea. On that very spot lay a green, weedy nodule of flint. Without stopping to examine it, I picked up a stone, and by a successful aim struck off a clean slice of it, thereby disclosing some gems of crystal that looked promising. Then with another stone I gave it one strong blow; a grand slice was struck off, and in an instant was exposed the most exquisite object I ever saw. A sponge

crystallised like Demarara sugar lay in its crystal grotto, of beautiful symmetry, and absolutely perfect. No specimen was ever more successfully treated; a glorious specimen of God's handicraft, which no eye but mine had ever looked upon, was in my hand! It was an ecstasy of delight! Miles have I trudged on the beach with bag and hammer; thousands of flints have I smashed since then. My cabinet is resplendent with many varieties of flint-treasures, but there is none to compare with that sponge so unexpectedly found, so rudely but satisfactorily brought to light.

Now these flint-sponges are a mystery, but long experience and familiarity with them may entitle me to offer some suggestions as to their probable history. I am convinced that the sponge did not grow in a hollow flint, but was first crystallised and then encased in a flinty sepulchre. I believe that the sponges grew originally in sea deep enough to be at rest and uninfluenced by tides. The water at some period must have been charged with silica in solution. The sponge acted as a centre, absorbing the silica, and gradually crystallising. When its silicification was completed, the sponge so metamorphosed acted as a secondary centre for further accretion; and by degrees the solid flint was deposited round it, ever increasing in thickness until these gems of God's workmanship were preserved in their adamantine caskets, to be kept evermore secure from all shocks of time and vicissitudes of age. Oceans might rage; continents might be elevated or submerged; terrific catastrophes of earthquake, fire, or hurricane might deal their destruction on all sides, but no power of Nature could hurt those gems enclosed in their armour of solid flint. The waves of future ages would seize them in their fury, and fling them upon the rocks, and then the stern necessity of tribulation would exert its influence to model the outer structure, but the treasures within lay absolutely safe, so that their most delicate crystals could sustain no damage.

There is a mystery still to be explained. How came the *cavity* in which lies my crystal sponge? How is it that the whole was not embedded in flint, that the chamber should be unoccupied except by its exquisite inmate, the ceiling crystallised in harmony, but the space of the room open? I have no answer to give on this point; neither can I offer any suggestion as to the causes which determined the cessation of the sponge's crystallising, and the commencement of the growth of its flinty encasement. These

are mysteries about which I would fain learn—some of God's secrets into which, by diligent observation and reverent reasoning, we may perhaps be initiated. Meantime I hope that this paper may arouse among some of its readers an interest in the search after flint-treasures, and draw from other observers information upon so interesting a subject.

EVOLUTION, CONSIDERED IN REFERENCE TO THE MARSUPIALIA.

By W. H. Davis *(Pres. Met. Sci. Assoc.)*.

(Continued from p. 29.)

The Echidnæ are terrestrial animals, covered with spines and hair intermixed, one species with long hair and short spines, another with short hair and long spines similar to a porcupine. The Ornithorhyncus is covered with long hair, is web-footed, and frequents fresh-water lakes and ponds. All these animals are essentially mammalian in structure, but so extreme are the modifications of the type, that they present a transition from the bird and reptilian form to that of the mammal. They are Marsupial in so far as possessing marsupial bones, but the presence of a pouch is wanting ; they are Mammal, and possess mammary glands, but the teats are absent, the milk passing through a perforated patch of skin. The jaws, like those of all living bird forms, are toothless, or with but rudimentary teeth, or sharp spinous processes. The males possess a pointed horny spur upon the heel, which is perforated, and transmits into the wound it makes the secretion of a peculiar gland, a mechanism of the Vertebrata only known in serpents. The shoulder is bird-like in form, but corresponds more nearly with that of lizards ; the brain is essentially bird-like in character. There is but one opening for the uro-genital organs, the contents passing into a single chamber or cloaca—an avian characteristic—whence the appellation of Cloacal, or Monotremes, has been accorded them ; and if to this we add that the egg is brought forth and hatched within the interior of its body (ovo-viviparous), you will readily comprehend without more minute detail (which would serve to heighten the abnormalities) that this

is indeed one of the most aberrant groups known. There is scarcely a portion of its organization in which avian, reptilian, and mammalian characters are not combined.

The members of the other group—the Didelphia—are transitional between these Cloacal or Monotreme forms and the Placental groups. The small herbivorous and insectivorous species present in their cranial character a smooth curved outline, as in birds, distinct from the rough, bony ridged character of the larger and stronger Carnivora, and even in these latter the bony palate in particular approximates more to the bird-like type than is known in any mammal of the Placental series. In the locomotive organs some have a hinder thumb like the Quadrumana, capable of being opposed to the other phalanges, the fore and hind-limbs especially presenting great varieties of modification.

The principal bond of union between the opposite hemispheres of the brain, viz., the Corpus Callosum, is wanting in the Marsupials, and in this they are greatly inferior to the Placentals. The presence of this structure has usually been considered as fairly indicative of the comparative degree of organization attained by the various groups of animals, as it is generally developed in the ratio of the magnitude of the cerebral hemispheres.

In order that we may fairly understand the mid-relation in which these Didelphous Marsupials stand, by taking the half-dozen most important points of their structure, and placing them in a tabular form, we can at once compare them on the one side with the Monotremes, and on the other with the Placentalia.

Characters.	Marsupialia.		Placentalia or Monodelphia.
	Monotremes.	Didelphia.	
Cloaca	Constant.	Embryonal.	Embryonal.
Pectoral Nipples	Wanting.	Existing.	Existing.
Clavicles united with breast, and forming a forked bone...	United.	Not United.	Not United.
Marsupial bones	Existing.	Existing.	Wanting.
Corpus Callosum	Feebly developed.	Feebly developed.	Strongly developed.
Placenta	Wanting.	Wanting.	Existing.

The comparison gives, as you will observe, an equal divergence of the characters on either side.

In our review of this peculiar order, the Marsupials, we have hitherto considered their structure mainly in relation to recent forms, for in Australia, and its adjacent islands, the group has lived on, and to all intents we have there preserved for inspection and investigation the fauna of the Oolitic period, for in no other part of the earth does any marsupial form now obtain, except the Opossums—a homogeneous group belonging exclusively to the New World. If then (Australia being unknown) our knowledge of the Marsupials had been dependent on the fossil forms alone, we should, if not unaware of the extreme interest attaching thereto, have been unable to point out their clear structural mid-relations to the Monotremes on the one hand, and the Placentals on the other.

The following table shows in a general manner the sequence of the appearance of the Mammalia on the globe so far as Palæontology has determined it.

Geological Epochs.	Order of Mammals.
Recent	
Pliocene	Man?
Miocene	Proboscoid Pachyderms, Edentata (Megatheria, &c.).
Upper Eocene... ...	Insectivora, Rodents, Ruminants, Whales, Monkeys.
Lower Eocene ...	Bats, Tapyroid Pachyderms, Carnivora.
Secondary Formations	Marsupials.

The first note of the discovery of fossil Marsupials in Europe, so far down as the Trias, is that of M. Plieninger, of Stuttgard, in 1847, when, after laboriously sifting a large mass of material from the Keuper Bone-bed, he discovered two minute almost microscopical teeth supported by two roots or fangs, this latter being a mammalian character. This form was named *Microlestes antiquus*.

Earlier discoveries of Marsupials had been made in England in the Stonesfield Slate, and in France by Cuvier from the gypsum deposits of Montmartre of Eocene age. In 1858, Mr. Moore re-

discovered *Microlestes* in the Rhætic Bone-bed at Frome, Somerset. In 1864, Prof. Dawkins discovered a worn molar of a Marsupial mammal, also in Somersetshire (*Microlestes rhæticus*) ; but it was due to the energy and perseverance of Mr. S. Beckles that a large number of forms were unearthed from the Swanage Dirt-bed, the last addition from this locality having been made by Mr. Willett, in the summer of 1880, with a lower jaw of *Triconodon mordax*. All these forms are of small size, and it is just questionable, in consequence of the very imperfect condition and paucity of the remains, whether some of them do not belong to the Insectivora, but in other instances their Marsupiality is beyond disproof.

We are therefore face to face with the fact that the first Mammalian forms were Marsupials—Didelphia or even Monotremata—and from these forms the evidence clearly and indubitably points to (we will not say proves) the course of evolution being onwards and upwards towards the higher placental forms. At the commencement of the Eocene period the earlier generalized forms had become more specialized, and had arrived at the stage marked by the living Opossum (*Didelphys*). In the Lower Eocene of France are two forms of Carnivorous Marsupials—*Artocyon* and *Palæonictis*, the former allied to the bear in its dental, and to the Marsupials in its cerebral character; and the latter resembling the existing *Tasmanian Dasyurus*, or, as the inhabitants prefer to call it, from its ferocious character, the Tasmanian Devil.

They show, as has been pointed out, that the European Carnivores were intermediate at this time between the Marsupial and Placental Mammals. Coming onwards, "in the Upper Eocene the Carnivora present the same association of Marsupial with Placental characters which has been observed in the Lower Eocene, and have not yet lost the traces of their descent from a long line of Marsupial ancestors; in the Lower Miocene the opossums still lingered in the forests of Europe, and the Marsupial ancestry of the Carnivores still asserted itself in the singular combination of characters offered by the Hyænodon ; with the close of this age we bid farewell to the European Marsupials."

It is in turning to the present home of the Marsupials that the fossil evidences are most abundant ; there have been discovered no less than 20 extinct species embracing seven genera distinct from any known genera living, exceeding the living exemplars in mag-

nitude, differing in the modifications of their teeth and the proportions of the limbs. In these larger ancient forms the quadrupedal character is more manifest than in the existing kangaroos ; these latter, as is well known, possess their two fore-limbs developed in a very unequal proportion compared with the length of the hinder ones, enabling the kangaroo, by the aid of a long and powerfully jointed tail, to use its hinder legs, combined with its tail, as a kind of tripod on which the body rests in an upright position, whilst the fore-paws are used for distending the mouth of the pouch, or for necessary changes of the position of the young therein ; but this inequality of character in the length of the limbs, admirably adapted as it is for leaping, when traced backwards to the older forms, is, through a series of modified fore-limbs, found at length to be non-existent in the larger types of Herbivorous Marsupials. These quadrupeds, although retaining in the main the kangaroo type, possessed fore and hind-limbs of equal length and size as in the herbivorous forms of the Placental group. There are three species of *Nototherium*, all showing a deviation from the kangaroo type to that of an ordinary character. In the Diprotodon—an enormous quadruped, whose skull alone measured three feet in length—the fore and hind-limbs were equal, and by their size were suggestive of elephantine proportions.

Thus it is in whatever direction we may look : if it be on living placental types, they point backwards to a Marsupial origin ; if we look on living marsupial types, they also point backwards to other modifications ; and when we examine the fossil types, everywhere are evidences of structure that have been undergoing in one sense vast and important changes of character suited to the varying conditions of existence.

(To be continued.)

REVIEW.

Geology of the Counties of England, and of North and South Wales. By W. Jerome Harrison, F.G.S. (London : Kelly and Co., 1882).

Students and others interested in the study have good cause to feel grateful to Mr. Harrison for the valuable aid which he has at various times rendered in the cause of geological science. By means

of this his latest work, he has placed the facts of English geology before his readers in a form which is easily accessible, even to those unaccustomed to geological investigation.

Here the student will find all that is to be desired in the way of detailed information respecting the geology of each county, preceded in each case by a list of important works or papers bearing upon the subject. Besides this list, the titles of the various Natural History and Scientific Societies located in each county are given, together with the names of local museums, all of which, with the list of books and papers, treating generally of the geology of England and Wales, placed at the beginning, will be found very handy for reference.

The book is well supplied with sectional views, diagrams, and other illustrations, is printed on good paper, and the type, though small, is very readable. Altogether it is a work which no student of geology should be without, for should he neglect its purchase, he will thereby deprive himself of a most useful and trustworthy guide to the easy determination and study of the rocks comprised in each county, both as to their lithological and palæontological characters.

NOTES AND QUERIES.

Notes on the Entomology of Mountfield, near Battle, Sussex.—During the hop-picking a great number of insects may be found at Mountfield. *Dioctria rufipes*, larvæ of *Dasychira pudibunda*, and *Orgyia antiqua*, green grasshoppers, "lady-birds" of many colours, aphides, &c., are to be seen crawling over the ground; being disturbed by the hop-picking, for a large number of insects live among the hops.

In the woods, also, are many insects, *Apis mellifica*, *Limenitis Sybilla*, *Pyrameis Atalanta*, *Satyrus Egeria*, *Thecla quercus*, and many others.

In the meadows may be seen, during the summer, *Asilus crabroniformis* (a black and yellow fly which kills caterpillars), *Vespa vulgaris*, *Pieris brassicæ*, *P. rapæ*, *Anthocharis cardamines* (scarce), *Gonepteryx rhamni*, which may sometimes be seen as early as February, *Colias Edusa*, sometimes in great numbers, *C. Helice* (a variety of *Edusa*), *Vanessa urticæ*, *V. Polychloros*,

V. io, *Cynthia cardui*, *Satyrus megœra*, *S. Janira*, *S. Tithonus*, *S. Hyperanthus*, *Cœnonympha Pamphilus*, *Lycœna Phlœas*, *Polyommatus Alexis*, and *Macroglossa stellatarum*.

There are several night-moths, among which may be mentioned the following:—*Plusia gamma*, *Catocala nupta*, *Phlogophora meticulosa*, *Gonoptera libatrix*, *Dicranura vinula*, *Triphœna Pronuba*, *T. Ianthina*. *Strangalia calcarata* occurs commonly.

T. D. A. C.

[Our correspondent does not mention *Euacanthus interruptus*, an Hemipteron *said* to be very destructive to the hop-plant. It is called locally "the dolphin," and is a prettily black and yellow-striped insect.—Ed.]

"Imperfections in Nature."—The very complete misunderstanding of the general drift of my lecture which E. H. H.'s query reveals, is due partly to the brevity of the abstract I sent you, partly, perhaps, to the ambiguity of words, such as *economy*. I stated that Nature was the reverse of economical, *i.e.*, lavish, in expenditure of life and other energy; but I did not venture to criticise the "economy" or general balance of Nature. I criticised structures and organisms as not being perfect, *i.e.*, altogether well adapted for existence; but I fully recognised that a struggle for existence and death to the weak had been decreed by the limitation of our earth's surface, and the slight limits on fecundity. Immortality in limited space must obviously be accompanied by limitation of numbers.

G. S. Boulger.

Pit Dwellings.—On Hayes Common, Kent, there are a number of small circular depressions in the soil from two or three feet to about 30 feet in diameter, and from a few inches to about two feet in depth. They are nearly all encircled by a low mound. The surface is thoroughly covered over with grass and the usual vegetation of the common, which, I think, clearly indicates that the depressions are (to say the least) of some considerable age. They have been supposed to be "pit-dwellings," or "hut-circles," marking the sites of former human habitations, although it is doubtful to what age or period we should assign them. The object of this brief note is to ask if any reader can tell me of any cause or

causes which appear likely to have produced these pits, supposing that they are not "pit-dwellings." I should also be glad to hear of any similar pits with which to compare them.

GEO. CLINCH.

NATURAL HISTORY OF LONDON.—Reading in the January number of NATURAL HISTORY NOTES Mr. Walker's pleasant and useful article on the "Fauna and Flora of London," I was reminded of an incident written about twenty years ago by my husband, the late Mr. W. Miller, of the Bank of England. It furnishes another testimony to the much that may be learnt of Nature's ways by all whose love of her makes them keen to pursue and swift to discover her footprints in unlikely as well as in likely places.

"I had no holiday last year. At the beginning of September I had to welcome home to the smoky City a large party of friends who had been vagabondizing through Cumberland and Westmoreland. To make their City home look as gay as possible, I levied a tax on my friends' flower beds, and a rich tax it was. 'You have been into the country for these,' said one, taking up a vase of English wild-flowers. 'Look at these purple centauries, and these hawkweeds, and here two kinds of milfoil, and see how graceful these grasses are, and he has got marigolds amongst them; they have no right to be there.' 'Well,' said I, 'I did get them, but I have not gone far out of my daily track. I gathered them in St. Paul's churchyard as I came along.' And I gathered there thirty-two different species of English wild plants, 'Earth's cultureless buds.'"

POLYANTHUS.—I have had some Polyanthuses sent to me in which the calyx-tube has become quite petalloid; indeed, both as regards texture and colour does the calyx so closely resemble the true corolla, that the flower appears to consist only of two corolla-tubes placed one within the other. Is this variety common in gardens?

COMMUNICATIONS RECEIVED FROM.—G. C.; T. D. A. C.; Mrs. P.; A. C.; W. R.

ERRATUM.—Page 29, line three from the top, for Ornithosauria *read* Odontornithes.

NATURAL HISTORY NOTES.

EDITED BY FRANK J. ROWBOTHAM,

(Memb. Geol. Assoc. of Lond.)

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THE ESTABLISHING AND MANAGEMENT OF MARINE AQUARIA.

BY J. W. WORSTER, L.D.S.

(*Concluded from p.* 42.)

The *Cereus gemmaceus* is another very pretty anemone, with lovely semi-translucent pink and white tentacles constantly waving about in search of prey. The *Anthea Cereus* is very common at most of our sea-side places, but rather difficult to keep in confinement. I have succeeded in keeping them for about four months, at the end of which time they generally sickened and died. Whilst in health, however, they are pretty objects, the tentacles being in continual motion, and of a pale green colour, tipped with pink and purple. They possess the power of stinging to a large extent, and on some human beings whose skin is very susceptible the effect produced is similar to that of nettle-stings. The pretty little green and red *Corynactis* thrives well in confinement, and is always an attractive object.

Various kinds of shell-fish may be kept, and the commonest, and at the same time the most useful, is the periwinkle, for he is a first-rate scavenger, grubbing about and eating up the refuse of the aquarium. The hermit crab will live for some time, but does not take kindly to any other home than the sea. I once had the good fortune to procure a pregnant female, who lived long enough to bring some of her progeny into the world, a few of which I mounted as microscopic objects.

The large rough Venus *(Venus verucosa)*, a bivalve of the cockle species, will live for a considerable time in confinement. In 1877 I brought one from Bordeaux Harbour, in Guernsey, and it remained an inmate of the tank until quite recently.

The common edible mussels will thrive for a long time, and are very interesting objects; the production of those fine silken threads, by which they attach themselves to the rocks, is a very pretty process, and one well deserving of close investigation.

There are several species of annelids which live in tubes that may be kept for a long time, and are very interesting creatures; their little tubes of lime, from the open end of which the creature protrudes its head, are often found cemented upon the shells of the oyster, &c. It possesses the means of withdrawing itself into the tube, and closing up the entrance with a kind of stopper or operculum, which is often thrown off, and forms a very pretty microscopical object. Of these annelids the *Serpula contortuplicata* is the most common, but unfortunately it will not live long in confinement; it forms its tube upon the surface of stones or shells by means of the lime which it abstracts from the water, and there passes the greater part of its time, with its head protruding in search of food.

The *Sabella* is another very interesting form of tube-worm. In this species the tube is not made of lime, but of some cartilaginous structure. It differs also from the last-mentioned annelid in not possessing an operculum. In appearance it somewhat resembles a sweep's broom, the fine rays radiating in all directions from the centre in a plane; but on the approach of danger these rays are instantly retracted into the tube, and there the creature remains secure until it thinks the danger past, when it slowly protrudes itself again, expanding in a most graceful manner.

Of all moving creatures the shrimps are the most interesting to keep in an aquarium; they live well, and afford every facility for observing their habits. They require sand to the depth of nearly an inch, in which they spend most of their leisure time partially buried, and it is interesting to watch the methodical way in which they go to work when they wish to bury themselves. After selecting the position they intend to occupy, they scratch away and loosen the sand immediately beneath their bodies; then raising themselves slowly, they suddenly fall into position with such force as to push all the loose sand from under them. After repeating the process two or three times they are generally pretty nearly hidden, with the exception of their antennæ and eyes. When all disturbance in the water has subsided, they cautiously take a look round to see if any portion of their body be left uncovered, and if

such be the case, they sweep up the sand with the antennæ, so as to effectually hide it.

Like other crustaceans, they grow by periodically changing their skin, and this process is very interesting to watch. For some hours before the event takes place, the shrimp swims about, apparently seeking some dark shelter; suddenly the poor thing seems seized with a series of rapid convulsive movements, the skin cracks at the back of the head just behind the carapace, and the head is completely withdrawn, leaving the old skin thrown back over the shoulders. After a few more rapid jerks and wriggles the entire body is in like manner drawn out. The whole performance is but the work of an instant, and then the defenceless creature, with a few languid flaps of its tail, steers to a place of shelter, there to await the hardening of its new skin. This is soon accomplished, and once more it takes its place among its brethren to fight the battle of life.

So thoroughly is the process effected, that the cast-off skin may be taken from off the water and set out, just as one would set a butterfly. It is, indeed, a source of wonder how the disengagement is effected from such delicate structures as some of the parts of the shrimp really are, but it is done in a most marvellous manner, even to the outer skin of the eyes and to the extreme tips of the antennæ.

The anemones wage continual warfare against the shrimps; in fact, they almost entirely depend upon them and other free swimming creatures for their food. If, in wandering hither and thither, some poor hapless shrimp should run foul of the anemone's tentacles, he is instantly surrounded by them, and in a few seconds so paralysed as to be quite unable to make any effort to escape. The unresisting body is then gradually drawn to the mouth of the anemone, which is capable of opening to almost any extent, and slowly disappears. At the end of some hours the shrimp is rejected by the anemone, but not before all nutrition has been abstracted from it. It is necessary then to remove the body from the tank, otherwise it will speedily decompose and make the water offensive.

As to the propriety of feeding the inmates of an aquarium, I am not quite decided. Mr. Gosse (who is a great authority on all matters connected with marine tanks) says, emphatically, that they ought not to be fed at all. I fed mine occasionally on small pieces of chopped-up oyster or mussel, but I almost think they get as much

as they require from the microscopic animalcules, such as infusoria and entomostraca, with which the water teems. Speaking of microscopic work reminds me that I had once a colony of flustra, which grew spontaneously upon one of the specific gravity bulbs; they commenced as one or two solitary polyps on the stem of the bulb, but in the course of a few months they so multiplied as to completely cover the entire surface.

And now for a few words about collecting. There is almost sure to be something or another interesting to the naturalist obtainable at every sea-side place, though some coasts are much more fertile than others. Where possible, a portion of the shore should be chosen some distance from a town, or at any rate where the drainage from a town is emptied into the sea.

A low, flat beach, well studded with groups of rocks which are all submerged at high-water, and where the tide recedes a long way, is almost sure to yield good results. Between the rocks will be found innumerable little pools, perfect little aquaria in themselves, and splendid hunting grounds for the lover of marine polyzoa. Here the pretty *Laomedia geniculata* may be found growing in profusion, and appearing like a filamentous fringe round the edge of the water. The *Sertularia* and *Campanularia* also flourish abundantly, besides hosts of crustaceans, star-fish, &c. What is commonly called low-water, or the time when the ebbing tide recedes to its utmost limit, is the period to be chosen for collecting, as comparatively few animals habitually live in situations where they are long exposed to the air and sun. Hence the lower the level the more rich becomes the harvest, and thus the time of spring-tide is the more productive, when the recess of the tide is the greatest. Spring-tides occur twice every month, viz., about the time of new and full moon; the very best tides of all are those of the second day after the change of the moon, but for two days before and two days after that they recede very far, so that we may consider those weeks which commence two days before the change of the moon, and end five days after it, as good collecting periods.

I have thus very briefly and imperfectly sketched out a few of the most prominent principles that must be kept constantly in view as a guide and rule by those who wish to keep marine animals at home with anything like success; and I need scarcely add that in addition to their scientific interest, they become more than mere objects of study; they become quite household pets, the source of wonder to not a few, and the admiration of all.

Once fairly started, a marine aquarium takes up very little indeed of one's time, and that little is well invested, for it brings in a good and ever-increasing interest,—interest in the form of knowledge as well as pleasure, for it is impossible to help gleaning ever and anon some fresh information concerning marine creatures, be they as humble as the periwinkle or as common as the shrimp.

LOCUSTS AND LOCUST-BIRDS.

Under this heading Mr. E. Barber has given in the "Transactions of the South African Philosophical Society" (vol. i., p. 193 *et seq.*) a long and interesting paper, from which we make the following abstract:—

The South African locust (*Œdipoda pardalina*) is not the same species as the European (*Œdipoda migratoria*). They appear in vast swarms from time to time, never remaining long in one place, but leaving ruin and devastation in their wake. They never cease feeding except when travelling or sleeping, but they frequently take their flight by night. The horse feeds on them with great relish, and cattle in seasons of scarcity take to a locust diet.

Sooner or later, however, the locust-bird, a brown swallow-like bird (*Glareola Nordmanni* *), makes its appearance, and in numbers "darkening the air in certain localities." These are occasionally followed by the white stork (*Ciconia alba*) and the grey mottled starling (*Dilophus carunculatus*). The locust-bird feeds on the locusts in their flight, and with their broad beaks cutting off the legs and wings of those that they devour. "These being severed in mid-air, fall to the earth like a shower of bright sticks and straws." The birds, however, do not confine themselves to feeding in the air; in wet weather or in early morning they hunt them up amongst the grass and bushes where the locusts have taken shelter.

Other enemies of locusts are the trap-door spider (*Nemesia*, sp.), scorpions, ichneumon-flies, *Tachinæ*,† &c. Many of the native tribes of South Africa feed on locusts, and are delighted at their coming. The Bakalahari follow them until they settle for the night;

* An allied species (*Glareola torquata*, or Pratincole), common in Eastern Europe, has been sometimes shot in England. It has great powers of flight. This bird, although extremely swallow-like in appearance, is now considered to belong to the plover family.—F. P. P.

† *Tachina* is a very large genus of flies; there are at least 200 English species. They lay their eggs mostly in the larvæ of other insects, one in each. When they have pretty nearly eaten out their nurses they emerge as perfect flies.—F. P. P.

then, digging large pits, they fill them during the night and early dawn. At this work men, women, and children labour incessantly. The pits, when filled, are covered over with long grasses and earth. Leaving the pits behind, the natives follow up the locusts, repeating the same operation for several nights, until they think they have enough. The locusts are dried in the sun after being boiled, and then ground down between flat stones. The meal thus prepared is usually eaten in its rough state. Kafirs, Basutos, Hottentots, &c., who only eat them when compelled by scarcity of other food, prepare large balls, which are baked or boiled over a slow fire. A thick porridge is another method of preparing the meal.

The eggs of these locusts, it is said, will remain in the earth uninjured for a long period.

F. P. P.

NOTES ON THE ENTOMOLOGY OF KENT.

Lepidoptera.

Diurni.

Argynnis Paphia, one specimen at Sevenoaks. *Vanessa urticæ*, very abundant; larvæ on nettle (*Urtica*). *V. Polychloros*, tolerably abundant; the larvæ may be found on elm. *V. io*, not rare. *V. Atalanta*, abundant; larvæ on nettle. *V.* (*Cynthia*) *cardui*, abundant sometimes, but scarce at others. I fancy that numbers of this insect cross the English Channel, which would account for their occasional abundance, for I have noticed that when there are a number of these butterflies about they seem most of them to be *worn*, as though they had travelled.

Melanagria Galathea, a few specimens caught near Margate. *Pararga Megæra*, uncommon. *Satyrus Janira* and *Cœnonympha Pamphilus*, abundant. *Satyrus Tithonus*, one specimen at St. Mary Cray. *Polyommatus Phlæas* and *Lycæna Alexis*, abundant. *Lycæna corydon*, one specimen at Wrotham. *Colias Hyale*, abundant at intervals. *C. Edusa*, common; the white variety, *C. Helice*, sometimes occurs. *Rhodocera Rhamni*, not common. *Anthocharis cardamines*, uncommon. *Pieris napi*, abundant, especially at Margate. *P. brassicæ* and *P. rapæ*, abundant; larvæ on cabbage, nasturtium, and other plants. The eggs of *rapæ* are laid on the upper side of the leaves of the food-plant, and are yellowish. *Hesperia sylvanus* and *H. linea* are abundant at Margate.

Nocturni.

Smerinthus ocellatus, not rare at Beckenham. *S. tiliæ*, tolerably common; larvæ on poplar. *S. populi*, very abundant; the eggs, which are green, may be found on the upper side of poplar leaves, and occasionally on the willow.

Sphinx convolvuli, one specimen on a fence at Beckenham several years ago. *S. ligustri*, scarce at Beckenham, but abundant at Margate, where the larvæ may be found on laurestinus, lilac, ash, privet, and elder, but they seem to prefer laurestinus.

Macroglossa stellatarum, not uncommon; larvæ on bed-straw. *Zeuzera Æsculi*, tolerably common. *Cossus ligniperda*, common; the larvæ live on the wood of ash and poplar trees. The egg is grey.

Hepialus lupulinus, rather scarce. *H. sylvinus*, one specimen at Chislehurst. *H. humuli* (Ghost Swift), common in 1881. *Zygæna filipendulæ*, abundant at Margate, but otherwise scarce. *Nola cucullatella*, one specimen at Beckenham. *Euchelia Jacobæ*, larvæ abundant on ragwort (*Senecio vulgaris*) at Chislehurst. *Chelonia caja*, abundant; larvæ on ash, dead-nettle, and stinging-nettle. *Spilosoma lubricipeda* and *S. menthastri*, abundant. *Liparis chrysorrhœa*, rather scarce. *L. auriflua* (yellow-tail moth), abundant; larvæ on hawthorn. *L. salicis*, common; larvæ on poplar and willow. The eggs are green. *Orgyia antiqua*, very abundant; the larvæ may be found on pear, laurel, potato, poplar, and other trees. The eggs are greyish brown.

Bombyx neustria, not rare at Beckenham; larvæ on laurel and apple. *B. quercus*, one specimen at Beckenham. *Odonestis potatoria*, not rare.

(To be continued.)

NOTES ON THE HABITS OF EARTHWORMS.

I have been much interested lately in observing the curious manner in which earthworms stop up the aperture of their underground dominions with various small twigs and leaves, &c. Upon very carefully opening one hole, I found the sides lined with small pieces of partially decayed leaves, mixed with a thin layer of lighter coloured earth, such as I have often observed to underlie the vegetable soil at a depth of about a foot.

This had evidently been brought to the mouth of the hole by the worm, as, in cutting across the hole so as to obtain a transverse section, I found the light-coloured earth formed a complete and

even circle, and stood out quite distinctly against the sombre colour of the surrounding earth.

I next turned my attention to the tuft of dead and decaying leaves which the worm had collected with much care, and had deposited at the mouth of its hole. Upon pulling this to pieces I found it to consist of no less than 76 leaves, of which number six were leaves of black currant trees, and the remainder those of a large pear tree close by. In this way earthworms must do much good by fixing down to the ground dead leaves which would probably otherwise be blown away by the wind, and which are so very abundant in fruit plantations as to form a valuable manure. A favourite object with the earthworms for stopping up their holes seems to be the catkins of filbert or cobnut trees. I have found one such catkin, six inches in length, drawn into a worm's hole to a distance of three inches, and this was done so carefully that no part of it was broken or injured. The size and shape of it were so exactly suited to the size and shape of the hole that one finds it difficult to believe that such an act as this could be the work of an *eyeless* creature. One fact is very clear : if earthworms have no eyes, they have at least a most delicate sense of touch by which they are doubtless guided in the selection of suitable material for the erection of those little heaps with which they are wont to cover their dwelling-places.

I am at present engaged in some experiments and observations on earthworms, which, if they lead to any results, I hope to insert in this magazine. In the meantime, I should be obliged if any reader of this note who may be able to throw any light upon this subject will be good enough to do so by sending an account of his observations to the Editor, who I am sure will be happy to receive and to publish the same.

Geo. Clinch.

EVOLUTION, CONSIDERED IN REFERENCE TO THE MARSUPIALIA.

By W. H. Davis *(Pres. Met. Sci. Assoc.)*.

(Continued from p. 49.)

We have already pointed out the connection of the Didelphia and the Monotremes, these latter, again, possess highly reptilian and avian structures ; in connection with this, a most interesting piece of evidence is now forthcoming from South Africa. Prof.

Owen last summer described before the Geological Society a form of Reptile obtained from the Trias of Graaf Reinet, South Africa, "Platypodosaurus robustus," presenting in its skeletal structure a large number of correspondences homologous with the two existing genera of Monotrematous mammals, so frequently referred to herein. The vertebræ, the sternum, the scapula, the manus, the humerus, the femur, each and all presented relations to the corresponding portions of the Monotremes. Prof. Owen, after detailing the many points of similarity, remarks: "One may conjecture on the derivative hypothesis that the higher class of Vertebrates, as represented by the low ovoviviparous group now limited to Australasia, may have branched off from a family of Triassic Reptilia, represented and at present known only by the fragmentary evidences of such extinct kinds as that which forms the subject of the present communication." Prof. Cope has also, from the Permian formation of Texas, obtained a Reptilian form that approximates still more closely to the Marsupials. Its scapular arch and humerus nearly resemble those of the Monotremata : the pelvic arch approaches the Echidna. It is not improbable that the discovery even of Marsupial bones may be made in this Permian reptile, judging from the other characters of its pelvis.

Our observations have hitherto had reference almost entirely to questions of structural resemblances and affinities, and before leaving this part of the subject I should like to point out a circumstance certainly not exclusively peculiar to Marsupials, but from their running as it were in a corresponding series almost parallel to the Placental group, it has occurred with some approach to frequency in their history. I refer to analogical resemblance (homoplasticity) to outward, external, appearances of form of some animals in this series to other animals of the Placental series. The Thylacinus, for instance, "is in general external appearance so much like that of a large dog, that the uninitiated can hardly be persuaded that its proper place is in another order of mammals; and even professed naturalists have fallen into the grave error of arranging it with the Carnivora, with which it has no real affinity. The same thing happens with the flying Marsupial Petaurus, which is a close counterpart in outward appearance of some of the flying squirrels ; one or two of the Antechini resemble the Jerboa. *Peragalea lagotis* has considerable resemblance to a hare, and carries its habits as well as its ears, making a form in the grass like it;" but in a small Marsupial, *Antechinus minutissimus*, the outward

resemblance to *Mus Delicatulus* (an Australian mouse, not Marsupial) is so perfect, that on a hasty inspection the most experienced naturalist might be deceived by it—yet one is Marsupial, the other not; the one has Rodent dentition, absent in the other; and so with other forms that might be cited.

The reasons for this analogy may possibly be explained on the grounds of like causes producing like effects, that the two resembling groups, in the respective series, have been subjected during their earth history to a similar series of organic conditions and forces acting in a like manner upon each, similar conditions producing similar results.

The naturalists of a previous generation ever endeavoured to account for the presence or absence of individualities, by their fitness to the accompanying environment of the animal, based on the assumed principle that the multiplicity of natural forms were each originated and placed in conditions suitable to their respective organizations. Evolution, whilst still keeping in view the fitness of organisms to their surrounding conditions, points out the path which nature has taken in producing these endless varieties of form, by showing how it is that as the natural conditions of existence ebb and flow, so must the organic forms continue in harmony with the conditions; thus, instead of the theory that the organism was made for the conditions, the Evolution theory clearly shows and explains that it is the conditions that make the organism as we find it. As we have already mentioned in the case of the Monotremes, they do not possess a pouch, and some of the other genera of the Didelphian group are also pouchless, but in Thylacinus the pouch is present, but the Marsupial bones are absent. Now from this it must be evident that any teleological theory that may be advanced can in no way explain the circumstances; if it be taken for granted, as has been done, that the Marsupial bones were given in order that by pressure upon them a due supply of nutrient fluid might be forced through the teats, why then are they present in one case and absent in another? Prof. Owen has suggested the following explanation as to the purposes for which Marsupials were supplied with a pouch:—

"I have always connected with the long droughts in Australia, with the extensive tracts where there are no waters, with the difficulty of obtaining that necessary element of life, the singular peculiarity of organization which prevails among the Mammalian

quadrupeds of Australia, viz.: the possession of a soft, well-lined, portable nursery-pocket, or perambulator. Take the case of one of our wild quadrupeds: suppose a fox or a wild cat. They make their nest; they have their litter. Suppose it should happen they must travel one or two hundred miles to get a drink of water, impelled by the peculiar thirsty condition of a nursing mother, but obliged to leave the little family at home, where would that family be when the parent returned from its hundred miles' journey—the poor little blind deserted litter? Why, starved to death. In order that quadrupeds should be fitted to exist in a great continent like Australia, where the meteoric conditions are such as to produce the dilemma I have instanced, those quadrupeds must possess an organization suited to such peculiar and climatal conditions, and so it is. That form of mammalian quadruped in this great continent, native to it and born so as to make their migrations to obtain that necessity of life, has the superadded pouch and genetic peculiarities enabling them to carry their young ones wherever they go, and since we find that Marsupial animals have lived in Australia from a very remote period, so we may infer that its peculiar climate has prevailed during as vast a lapse of time."

This is highly ingenious, but, as Mr. Andrew Murray has well remarked, will not bear much handling. It will not, of course, apply to those poor pouchless Marsupials; the young there have to be satisfied by merely clinging by their toes to the long hair of their perambulatorless mother. Further, the young litter would be still better protected by remaining unborn, as in the placental animals, until they are nearly ready to take care of themselves. Besides this, purely desert animals are able to live without water; if such an apparatus were necessary for desert animals, those inhabiting the Sahara have more need of it than those in Australia. Moreover, though Australia is subject to periodical drought, and in some parts is desert, that is by no means its general character. Lastly, if it is a true explanation, it should follow that the whole earth in the Oolitic and Eocene epochs was as dry and thirsty as Australia now is—a supposition inconsistent with the known luxuriance of vegetation in those times. Everywhere the teleological argument breaks down, and the reverse theory is forced upon us.

(*To be concluded.*)

NOTES OF GEOLOGICAL RAMBLES AROUND BEDFORD.

Though good sections are not to be met with in the intermediate neighbourhood of Bedford, some knowledge may yet be gained concerning the geological structure of the county with the aid of the Survey maps and Mr. Harrison's useful work on the geology of the counties. I can do no more here than merely indicate the positions of the chief strata with relation to the town of Bedford itself.

North of the town, which is situated on the gravel deposits of the Ouse, extends the wide region of Oxford Clay, forming low undulating ridges covered with Boulder Clay, divided on the north-east by the valley of the Ouse. At Oakley, north-west of Bedford town, the Ouse, which previously had traversed the Oolitic strata, enters upon the Oxford Clay, and at this point, the valley, which hitherto had been very narrow, suddenly widens to the extent of two to four miles, and, flowing through Bedford, the river turns again northwards.

To the south of Bedford the outcrop of the Lower Greensand occurs, followed by that of the Gault, and, further south still, the chalk downs of Dunstable and Luton, capped in places by outlying patches of "Reading Beds" of Tertiary age, complete the upward succession of rocks.

Proceeding along the Clapham road, we find the Cornbrash exposed in a section at Buckscale's lime-kiln, about two miles north-west of Bedford, from which fossils may be obtained. Half a mile west of Bedford a section may be seen in Cox's stone quarry by the side of the river. This section lies in a direction due south of the other mentioned, and the following notes which I made of both these exposures are given for comparison :—

SECTION IN BUCKSCALE'S LIME-KILN ON THE CLAPHAM ROAD.

	FEET.
Surface soil, &c., about	1
1. A hard bed, consisting of limestone with sand and clay, in which workmen say they meet with fossils	2
Passing down into—	
2. Loamy clay with nodular masses, about	5
3. A compact blue limestone (of Great Oolite age), about	3
4. A band of tough laminated clay ("Great Oolite Clay"), containing broken remains of shells, &c., about	1 (or less)
5. Oolitic limestone (as No. 3), extending to base of section.	

Bed 2, in the above section, was rubbly in character—crumbling easily in the fingers—and consisted of clay and sand, in places containing more of the former than the latter. In this bed I found selenite occurring here and there. Nodular masses of limestone were also observable, scattered throughout the matrix, containing shells of Terebratula, &c.; these hard nodules were much worn and iron-stained. I noticed what appeared to be sulphuret of iron present in great quantity in this bed.

Taken as a whole, this appeared to be a kind of *passage-bed* between the band of Cornbrash above (No. 1 in section) and the bed of limestone (No. 3) below.

The band of "Great Oolite Clay" (No. 4) was very conspicuous in the section, occurring as it did immediately below the bed of hard limestone; no passage was observable between them.

On comparing the above section with a second a few yards to the east, I found Bed 1 about the same thickness, as far as I could determine, also Beds 2 and 3, but Bed 4 had thickened rapidly in the short distance between the sections, being here four feet as against one foot in the first exposure.

With reference to the first section, the workmen informed me that they intended going many feet deeper for the limestone, only a few feet of which were then exposed at the base.

SECTION IN COX'S STONE QUARRY, NEAR THE IMPLEMENT FOUNDRY, BEDFORD.

	FEET.
Surface soil, &c.	1
1. Below the surface soil a loamy bed commenced, light red in colour, at the base of which a number of pebbles were observable, together with what appeared to be pieces of broken shells. This gradually gave place to a lighter coloured band with pebbles, &c.	4 to 5
2. A tolerably regular band of limestone nodules, packed closely together, giving the band a chalky appearance	2 or less
3. A limestone bed, breaking up into laminæ at face of section	3
4. A clayey limestone (? slate-marl), dark slaty colour, extending to base of section, and holding the water. This rock, on exposure, hardens, and assumes a grey colour.	

On comparing the section just given with that from Buckscale's Kiln, we find that in the latter we meet below the surface soil with

about two feet of Cornbrash (?), followed by five feet of what appears to be a passage-bed between the Cornbrash and the underlying limestone, this latter bed, with an intermediate band of "Great Oolite Clay," extending to the base of section. In Cox's pit, which lies close beside the river, we find below the vegetable soil a series of what appear to be alluvial deposits of the Ouse, consisting of sand, clay, pebbles, &c.; and to this succeeds a narrow but tolerably regular band of limestone nodules (No. 2 in section), below which again the fissile limestone (the representative of Beds 3 and 5 in Buckscale's section?) appears, together with slaty beds extending to base of section.

Now we here notice the absence of the Cornbrash represented in Buckscale's pit by the beds of limestone and rubbly clay with hard nodular masses; but we find in its place the band of nodules forming Bed 2 in Cox's section.

As far as I am able to read these sections, they appear to present the following facts, viz., that whereas in Buckscale's pit the Cornbrash is represented, in Cox's section it has been removed by the river in former times, and is now represented solely by the layer of nodules. These nodules, dispersed amongst the limestone and sand forming the Cornbrash in Buckscale's section, being too heavy for removal by the flowing water, were tumbled about and worn, whilst the soft matrix which enclosed them was carried away, and finally they were deposited as a layer by themselves; and when the river cut down to its present level, it left superposed on this layer the ordinary alluvial beds which we find represented by the sand, clay, and pebbles in the section.

With reference to the band of "Great Oolite Clay" which was found to interpose between the two beds of limestone in Buckscale's section, I have already noted that it thickens considerably to the eastward, but in Cox's pit it has apparently thinned out and disappeared altogether.

Frank J. Rowbotham.

(*To be continued.*)

REVIEWS.

Postal Microscopical Society.—We have received the first number of the new journal of this useful Society, which is announced to appear quarterly. It contains numerous papers on subjects connected with microscopy, selections from the Society's Note

Books, reports of Societies, correspondence, &c., together with a short history of the Society itself; in all, 56 pages, with several illustrations and five plates. This journal promises to become an important addition to microscopical literature, and we wish it the success it deserves.

Mr. T. Bolton's Portfolio of Drawings.—No. 7 of this work came to hand too late for notice in the April issue. It contains, as usual, a fair assortment of sketches of living organisms, animal and vegetable, accompanied by short descriptions, which, taken as a whole, form a good shilling's worth.

NOTES AND QUERIES.

"Friendship on All-fours" (No. 3).—I have noticed what I believe to be a rather singular incident of confidence and gratitude. One very wet night last winter our dog came in, accompanied by a stray kitten. Now, though the best of friends with our own cats, he is in the habit of spending *hours* watching for a chance to bark at those of our neighbours. However, it was declared by Doggie's partisans "that he never attacked anything smaller than himself;" the rest of the household hinted that "he had never been known to attack anything that did not run away," and this kitten instead appeared to have voluntarily assumed the position of his shadow. It coolly laid claim to his supper, and disposed of it, the dog looking on with his head a little on one side, and with a decidedly amazed, though amiable expression of countenance, which very much astonished us, for to take from his plate is a liberty we never saw allowed before without disastrous results. The kitten remained two days with us, and then we found its owner. Since that time the kitten (now a cat) is in the habit of paying us periodical visits. It devotes itself exclusively to the dog, and if he is out when the cat calls, it stations itself close to the glass door, and awaits his return. These visits cannot well be attributed to cupboard love, for it refuses all hospitality, nor to a dislike to its home, as its stay rarely exceeds two hours.

A. E. C.

Polyanthus.—The polyanthus referred to in your April number, p. 52, I suppose to be what is commonly called the "*Hose in hose*" polyanthus, or primrose. It is not uncommon, and used often to be found in cottage-gardens. There is a deep crimson variety, and

another in which the calyx is of crimson and green intermixed, the corolla being all crimson. There is a fashion in flowers as well as in ladies' bonnets, and the "*Hose in hose*" primulæ are coming into fashion again.

St. Mary Church, Devon. G. H. W.

Praying-Mantis.—We had two specimens of the praying-mantis that were kept in a fern-case. The first one, a large fat green fellow, was captured on the aqueduct. A few days afterwards we caught another, a smaller brown one, near Albaro, and introduced him to his companion when we got home. The next morning, when I went to see how they were getting on, all that I could find of the brown one was his head, wings, and legs, whilst the green one was remarkably swollen, and remained perfectly motionless for a week, at the end of which time it feasted as usual off the blue-bottles that I caught for it, and which it used to catch by springing upon them when within reach.

Genoa, Jan., 1882. Stanley Bright.

Entombed Cat.—Some friends of mine have recently been disturbed by rats, as they *thought*. They could get but little sleep from the noise and from terror, for rats are not agreeable creatures to meet in one's bedroom. Pussy was had up, and she seemed very uneasy. At last some one thought they heard a cat crying in the room above ; the boards were loosened, and, after some trouble, a poor gaunt skeleton of a cat came out. It was ravenous, and no wonder, for it had been there more than a fortnight, and the noises at night were caused by its struggles to get free. It must have gone in search of mice down a hole, which was afterwards stopped up, and, being a stranger, the cat was not missed. Food was given immediately, and plenty of milk, but the poor thing has since disappeared, no one knows whither.

It is with the deepest regret that we learn—at the moment of going to press—of the death of Dr. Charles Darwin, on the 19th of April, in his 74th year. Those who had the opportunity of perusing the article (penned in the well-known masterly style) which he contributed to *Nature* of the 6th of April, "On the Dispersal of Freshwater Bivalves," will feel how comparatively sudden his end has been.

NATURAL HISTORY NOTES.

EDITED BY FRANK J. ROWBOTHAM,

(Memb. Geol. Assoc. of Lond.)

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PLANT SYMBOLISM, AS CONNECTED WITH THE EARLY HISTORY OF MANKIND.

BY S. MARSHALL, F.R.Hist.S., &c.

Much has been written from time to time on plant superstitions in this and other magazines and journals. Most of the articles, however, having had principal reference to, and quotations from *sub-fossil* authorities, perhaps a few remarks on the origin of these superstitions, with an attempt to guide the student to search deeply into their history, may be of some small use to readers of NATURAL HISTORY NOTES.

One must in this study, as in so many others, go patiently backwards along the traces left of human history by the chariot wheels of time, and see how the whole history of plant superstitions and plant symbolisms has its origin in the very beginning of man's necessities, struggles for existence, dawn and rise of his knowledge of the earth and its organic and inorganic products as affecting principally his existence on the earth.

We shall scarcely need to touch more than lightly here on man in his first animal and ape-like life, except to call attention to the fact, now well known, that in this early stage man, not yet possessing more than a modicum of his now vaunted superior intelligence and powers of reasoning, was at a greater disadvantage than the animals round him in the struggle for life.

Many animals were of greater size and stronger muscular powers than he. Some possessed organs for flight and life in the air, the seas, and the streams ; others had powerful jaws for masticating tough and rough food, claws for defence, or for grubbing in the earth to find food, or to hide what could not be immediately devoured. Others, again, had prehensile tails for climbing trees to reach their fruits, or for escape from foes ; while they were

provided against the effects of climate by hairy or hard natural coverings, varying occasionally in colour according to the season, or colour of the soil they dwelt on, or strong scales and bony or shelly coverings for natural houses, shelter, and defence.

All these advantages man, gifted, like the apes, with an extremely strong sense of mimicry, learnt to imitate, and, in time, to improve upon vastly, as the advantages possessed by civilized man clearly show.

His dawning reason, cunning and mimicry, placing him in possession of tools, however rude, stones with which he broke open the husks of great fruits, as monkeys are seen now to do in their wild state, and means, by these stones, of knocking off from the rocks and breaking open the shells he found on them,—twisting tough climbing plants, teaching him to twist cords by which he too could climb, or which he could use for catching his prey, he soon became able, not only to fight with, but to overcome the fiercest, strongest and swiftest animals.

Then early began man to be distinguished from his brute fellows by one marked difference. Animals, it is true, herd together for mutual advantage, and even among them we notice the most cunning, or most clever, as we should say, obtain a sort of mastery over its fellows. But we do not see animals dividing reasonably into classes, as even the most savage tribes of men do at an early stage. Savages, even when the tribes are of a very small number, soon separate into the strong and the wise. There is first the king, or head warrior, to whom all the strong men gather themselves.

The fighting strong man was of necessity in the early stages of human development, the most important man; for in brute days brute force is king. The hero is the man of muscle; the fearless, not sensitive—the merciless and dominant nature is needed for the rough and merciless struggle.

Those around him know his power to defend the tribe, and they obey, follow, and flatter him. The rougher and more brute-natured a man is the more he loves flattery. Civilized men and philosophers are always more indifferent to flattery than savages.

The king and warrior had for dear life's sake to wage war for food, hunting and fishing boundaries. To kill and eat their foes, to destroy weaklings of both sexes, and to reduce the number of mouths to eat, was the necessity of the earliest savage state. Fruits and plants eaten by the animals were also eaten by men. There was no room or time for the thinker as yet.

The naturalist and future scientist made his appearance first in the guise of king's flatterer or poet-laureate.

Just as all animals by sounds or signs manifest delight when they have achieved any success, so man must boast under similar circumstances. But, as eloquence and brute force seldom are found allied in one individual, there must be found a boaster for the king.

This eloquent man, the pro-poet-laureate, combined in his person the qualities and office of poet and priest. He was, in fact, the clever fellow of the tribe, and although he might not feel able to fight, or might prefer an easier life than that of the hunter or warrior, yet he too, had in a way to work for his living, and to keep up his character for wisdom. He might accompany the warriors on their expeditions, but even then he must, by costume or customs differing from those of his tribe, set up a claim to greater superiority, so that he lived and ruled by his wits and had a kingship of his own.

When the time came to boast of what the king or other warriors had done, the boaster, eloquent as he might be, would have frequently been arrested in his outpouring for want of fresh matter. So he early learnt to signal for clapping of arms and shields at certain pauses. (The orators of to-day give these signals for applause by certain well-known falls of the voice or "clap-trap" gestures.) Then the boaster, availing himself of the pauses, supplementing them himself by twanging or banging upon some rude instrument, was the unconscious initiator of recitative and rhythm, while he was in reality thinking what next to say!

Being the one stay-at-home of his tribe, this early *thinker to the community* soon began to think to good purpose, and we get gradually combined in him poet, priest, astronomer, &c., the pro man of science. He laid claim to miraculous power; the miracle being the everlasting miracle of mind over matter and over ignorance.

He laid claim to especial communion with the gods; and with the forces of nature, which were indeed gods and mighty powers to them, he did hold especial communion. He it was who, shutting himself from the sight of his fellows in separate dwellings, or wandering alone night and day, gradually learnt secrets of nature of infinite use to the tribe. He knew the way of the clouds, the changes in the position of the stars, the effect of the light or heavy atmosphere on smoke rising and falling, and on mist and dews. He knew the flight of birds, the haunts of strange, noxious, or use-

ful beasts, the properties of plants; and so he became the oracle, the priest, the great power to be dreaded and obeyed, fed and propitiated by the tribe. The movements of the savage army depended on his dictum.

He was the one who first learnt to kindle and keep up a fire.

The people saw and trembled before the fire nature kindled in the hearts of the volcanoes, or flung down from heaven in fiery meteors and lightnings. They heard the strange groans and moans in the forests as the dry branches rubbed against each other, whence sprang the consuming flames that devoured forest, grass, cattle, man and his dwelling, roaring as it went and then suddenly vanishing.

The savage thinker noted in his wild and lonely life how these fires arose. He rubbed the wood branches together, and learnt what kind to choose and in what condition. He made the people believe and worship the blocks of wood, while he, as magician, oracle, priest, and secret scientist, brought the wooden gods to yield up, at his will, in hidden places, and with mysterious rites, the fire that was so sorely prayed for and required.

He it was who, when dire necessity forced men to be vegetarians, found out the secrets of vegetable life, and must have made experiments on living animals, probably on his weaker fellows, captives, or those sacrificed to the fire and storm gods—to observe what were the deadly, what were the sedative, narcotic, intoxicating, or nutritious plants. Not only this, but he early initiated a sort of plant-language, a real "language of flowers," useful indeed then, when savage languages lacked words to express abstract ideas, as useless now in our over-languaged ladies who play with the language of flowers and never dream of studying the survival in their dainty books of the strange plant symbolism of their savage ancestors.

(To be continued.)

EVOLUTION, CONSIDERED IN REFERENCE TO THE MARSUPIALIA.

By W. H. Davis *(Pres. Met. Sci. Assoc.)*.

(Concluded from p. 63.)

Let us now shortly summarize and review the facts and arguments of the whole case.

We start with an enormous number of diverse organic forms

grouped together, possessing, in common, one single character that runs through every one of their number. That character is a vertebral column. From these diverse organic forms we select a large number which, in addition to their possession of a vertebral column, are bound together by a sum of characters which we have denominated *Mammaliality*. From these latter we have again selected a number of forms which, in addition to their possession of a vertebral column, and the characters of Mammaliality, are further bound together by a sum of characters which we have denominated *Marsupiality*. This latter order we have had exclusively under review—a vertebrate mammaliferous marsupial series of animals. We have seen from geological evidence that this group of marsupials is the oldest of the mammalian series; that if it is a question at all of one form being evolved from another, this particular group is the parent one of the Mammalia; that this is a probable view of the case is shown by its being more lowly organized in structure than the remaining orders of mammals, by its affinities to forms lower than itself—to birds and reptiles; and by its affinities to forms higher than itself—the Placentalia; and standing more or less midway between the two. In the lower genera of Marsupials, the Monotremes, this is especially evident in their imperfection of Mammalian characters and their imperfection of Marsupial ones. Moreover the other group of Marsupials—the Didelphia—as a whole, stand, as our table shows, between these Monotremes and the Placentals. On the other side, we have seen that there were Placental forms that retained many of the characters of Marsupials, and as we come onwards in time these marsupial characters have disappeared, and placental ones alone remained. Still further, when we examined the extinct forms of Marsupials, we found the dividing line between them and the Placentals, as it now exists, was not so strongly defined as at present; the limits were more approximately equal in the two series. We have also seen that the whole group of Marsupials present subdivisions similar in character to the subdivisions of the Placental group, and, as the evidences in favour of the evolution by descent from lower forms are exceptionally powerful, as we have seen in reference to the Marsupials, and as the whole sum of changes exhibited in the group itself, whether we consider size, form, structure, capabilities, or adaptation to diverse conditions, are exceedingly varied; if we are constrained to admit evolution in this

one case throughout the range of Marsupial forms, we shall be without doubt constrained to admit it in the case of the other—the Placental series, although the evidence may not be so perfect in the one instance as in the other. We can, of course, withhold assent to the deductive reasoning, but it will avail us little against such other evidences as can be brought forward in reference to the Placental series alone. And, lastly, we showed how, in reference to the Marsupial group, the argument of special creation, and special adaptation to the conditions existing, utterly and totally failed; and that the theory of the evolution of living forms by modified descent was alone able to explain the circumstances and conditions of the case.

HINTS ON COMMENCING THE STUDY OF BOTANY.

By Prof. Boulger, F.L.S., F.G.S., F.R.G.S.

(Continued from p. 34.)

The medical, pharmaceutical, or horticultural student will require to supplement Oliver as to useful plants and their properties from Henfrey, chapter III.; but as this chapter is far too full for the most retentive memory, the more important parts must be selected. There are about 275 known orders of flowering plants, of which, while some include several thousand species, others may even contain but a single form. About 150 have any real importance, though small groups may have great structural interest. Rather more than 90 orders are represented in the British Flora, 77 in Professor Henslow's Floral Dissections. With my own pupils I am in the habit of giving two lists of orders, those of first-rate and those of second-rate importance. Of the first, or "*a*" orders, everything in Henfrey or Bentley is to be learnt with care, whilst with regard to the second, or "*b*" orders, only some points generally interesting in structure, which I note in my lectures, are needful to the tyro. Orders not in either list are occasionally mentioned for some one economic product. The "*a*" orders are Ranunculaceæ, Cruciferæ, Caryophyllaceæ, Malvaceæ, Aurantiaceæ, Linaceæ, Geraniaceæ, Leguminosæ, Rosaceæ, Umbelliferæ, Compositæ, Ericaceæ, Oleaceæ, Primulaceæ, Solanaceæ, Boraginaceæ, Labiatæ, Scrophulariaceæ, Euphorbiaceæ, Urticaceæ, Artocarpaceæ, Cupuliferæ, Salicaceæ, Palmaceæ, Aroidaceæ,

Liliaceæ, Orchidaceæ, Iridaceæ, Graminaceæ, Cyperaceæ, Pinaceæ, and Taxaceæ. Of course much will be already known of these 32 typical orders, only three of which are exotic, from previous work with Oliver, and in structural botany; but, unless pressed for time, the student, even in his second year, had better confine his attention to them. He ought then to be able in September to begin work on the Cryptogamia.

In so doing he should first read carefully the few concluding pages in Oliver which deal with the subject, and then proceed to pages 408 to 472 in Henfrey, or to the beginning of part iv. in Vines' Prantl. This part of Henfrey, having been revised by Mr. George Murray, of the British Museum, one of our best Cryptogamic morphologists, is scrupulously accurate ; but it has suffered considerably by its compulsory condensation, and its adaptation to a now obsolete system of classification. It is now generally agreed that the merely physiological distinction of the presence or absence of chlorophyll, or green leaf-colouring matter, in a plant—the only valid distinction between Algæ and Fungi—is not a scientific basis for a classification which aims at being "natural" or "genetic," *i.e.*, at expressing the order of evolution. Similarly the separation of Lichens, from their being Aërophytes (or deriving their food from the air, and not from water or from decayed organic matter), into a distinct class is now generally abandoned; and they are classed among Ascomycetes, either Pyrenomycetes or Discomycetes.

The tyro need not, however, vex himself much about systems of classification among the Cryptogamia, as he cannot hope as yet to become acquainted with any great number of species in all the various groups, and so had better content himself here with the careful study of types.

For a good résumé of the whole subject, botanists are awaiting with interest the appearance in the International Scientific Series (Kegan Paul and Co., 5s.) of a volume by Messrs. A. W. Bennett and George Murray, but meanwhile the best descriptions, so far as they go, are those in Huxley and Martin's Elementary Biology (Macmillan, 6s.). This work includes animal types, a knowledge of which will widen the student's views of the principles of morphology and physiology, not to speak of examinational advantages. It is also eminently practical in its accounts of the various necessary dissections ; but among plants it deals only with Protococcus,

Bacteria, Yeast, Mucor, Chara, the Mushroom, the Bracken, and the Bean.

In Mr. Bennett's translation of Thomé's Botany the types required in the London University Examinations are treated with greater fulness than others; but perhaps the best course to pursue would be to read pages 110 to 170 in Vine's Prantl (second edition), paying particular attention to the accounts of the Diatomaceæ, of Fucus, Vaucheria, Caulerpa, Volvox, Œdogonium, Chara, the Schizomycetes, Saccharomyces, Mucor, Saprolegnia, Phytophthora, Tuber, Peziza, Usnea, Sticta, Puccinia, Agaricus, Marchantia, Sphagnum, Polytrichum, Pteris, Equisetum, and Lycopodium, to examine these plants practically, since they are readily procurable, comparing your work with the Biological Atlas of the brothers McAlpine (W. and A. K. Johnston), and to revise your work with Professor McNab's Outlines of the Classification of Plants (Longman's, 1s. 6d.), in which these types are fully, though succinctly, described. There is, within the range of these few genera, much that is unknown or uncertain, and certainly more than enough work in morphology and physiology to occupy one during a single autumn.

The Agarici, the mosses, the British Sphagnaceæ, Ferns, Equisetums or Lycopods afford good opportunities for the exercise of one's powers of discrimination; and, if we wish to preserve these subjects of study, there are sufficient directions in a little book on "The Preservation of Flowers and Fungi in their Natural Colours," recently issued by subscription by Mr. James English, of Epping.

(*To be continued.*)

BRITISH BUTTERFLIES UNDER THE MICROSCOPE.

The different species of British Butterflies present many beautiful microscopic objects. The scales on the wing of the insect often resemble in their arrangement the tiles on a house-roof; and when rubbed off and microscopically examined they are seen to possess a complicated structure, and every variety of shape. This structure consists of one layer of transparent membrane and two layers of colouring matter, generally arranged in longitudinal streaks. In the battledore scales, from the males

of different "Blues," the colouring matter is arranged in rows of spots.

Some scales are peculiar to certain places or colours; for instance, long, narrow scales, passing by every intermediate gradation into hairs, occur principally at the fringe, or hind margin of the wing. This fringe is generally largely developed in slowly flying butterflies, but is more or less absent in those whose flight is swift. Another characteristic scale occurs, firstly, where one wing overlaps another; secondly, in iridescent or shining patches; and, thirdly, occasionally in the brightly coloured wings of certain Vanessidæ. The shape of this scale is generally oblong, with the corners rounded off, but sometimes it is more spherical. A curious exception to the first case is seen in the Duke of Burgundy Fritillary (*Nemeobius Lucina*). The scales underneath the forewing, near the base, are *notched*, instead of being rounded off as in other butterflies. The silvery spots of most of the Fritillaries present an exception to the second case, where the scales are very slightly notched, for example the almost circular scales forming the shining parts of *Melitæa Artemis*.

The scales on the nervures are often narrower than those belonging to the rest of the wing. On *Parnassius Apollo* (a Swiss mountain butterfly), near the base of the forewing are some large nearly semicircular scales, with about seven notches in them; on the edge of the wing the scales are so narrow, and far apart, as to make it nearly transparent. Between these two different forms of scales are at least a dozen intermediate forms.

Some scales seem to belong exclusively to the male sex, as, for instance, the plumed scales from the Garden Whites; others are found on the male Orange Tip (*Anthocharis Cardamines*). The battledore scales from the males of several Blues (*Polyommati*) have already been mentioned.

In the English butterflies, the scales (except those forming the fringe) are too small to be easily seen with the naked eye. But some moths present exceptions to this rule. The Buff Tip, for example, has large sand-coloured scales, which are not so large, however, as those on the back of the Convolvulus Hawk Moth. These scales are mixed with the hairs, and form quite a distinctive feature. The Privet Hawk Moth (*Sphinx ligustri*), and others of the same genus, possess only ordinarily sized scales in the same place. It is impossible to imagine how and why they *Naturally-*

Selected themselves there, for they are quite hidden among the hairs, and do not seem to serve any useful purpose.

I will now enumerate, in order, the most striking parts of different butterflies that will repay examination with the microscope.

First comes the Swallow Tail (*P. Machaon*). The orange spot at the anal angle of the hindwing is a very beautiful object. The scales on the blue band are also worthy of notice. The prettiest portion of the Brimstone (*G. rhamni*) is the base of the underside of the hindwing, and which is best seen in the female. There is first a row of pink and cream-coloured scales, then one of rich brown, on which follows the greenish yellow of the rest of the wing.

The silvery white scales near the inner margin of the underside of the forewing in *Colias Edusa* and *Hyale* should be seen. The fringe and costa of these butterflies is also very pretty.

On the males of the Garden Whites we find some curiously shaped scales, but nothing very beautiful. The mottled green of the underside of the Bath White and the Orange Tip is very interesting; the scales are not *green*, but some are black and others yellow.

Some of the scales from the fringe of the Speckled Wood (*Lasiommata Egeria*) are shaped like the arrows of cuneiform inscriptions. The white scales from the centres of the eye-spots of this and the following genus are very pretty. The underside of the hindwing of the Grayling (*Hipparchia Semele*) is worth observing.

The changing purple scales in the male of the Purple Emperor are pretty; those in the female are similar in form, but lack the brilliant colouring. The orange spot on the underside of the hindwing is also rather pretty.

There is much to be seen in the next genus, Vanessa. The reddish pink in the discoidal cell of the underside of the forewing in the Painted Lady (*V. cardui*) should be seen. The underside of the hindwing of *V. Atalanta* (the Red Admiral) is pretty; so also is the red band on the underside of the forewing. The blue spots of the Camberwell Beauty (*V. Antiopa*) consist of delicate lilac scales placed on a black background; the chocolate-coloured scales are also very handsome. The Peacock (*V. Io*) and the Large and Small Tortoiseshells (*V. Polychloros* and *urticæ*) are more or less pretty all over.

The underside of the Comma (*Grapta C. album*) has a row of greenish spots, composed of scales similar in shape to those forming the green ground-colour observable in the underside of most of the Fritillaries.

The underside of the hindwing of the Silver-Washed Fritillary (*Argynnis Paphia*) is very beautiful ; the scales, which are yellow and green in different lights, are hollowed out—a feature rare in the Rhopalocera, but almost general in the Noctuina. The pearly spots of the Queen of Spain Fritillary are very pretty ; and the rich browns from the undersides of the genus Melitæa should be noticed.

The Hairstreaks come next. They all possess, just above the discoidal cell on the forewing, a little cluster of scales, smaller and rounder than those on the rest of the wing. In *Thecla rubi* some of these scales are yellow ; in *T. pruni* they are lighter in colour than the surrounding scales ; and in *T. W. album* they are the same colour. That portion of the underside of the hindwing which is situated near the anal angle is pretty in all these butterflies ; but the Green Hair Streak (*T. rubi*) is perhaps the most beautiful of all our butterflies. In this insect the green scales of the underside are not *plain green*, but dark green speckled with a lighter shade, producing a very fine effect.

The brilliant colour of the Large and Small Coppers (*Chrysophanus dispar* and *Phlæas*) does not look well under the microscope. It often happens that gaudy butterflies will not bear a close examination.

The brightly coloured scales of the female Holly Blue (*P. argiolus*) are very pretty. The fringes occurring throughout this genus, together with the ground-colour of *Adonis* and *Corydon*, form the prettiest features of the group.

Among the Hesperidæ or Skippers the underside of the Pearl Skipper (*Pamphila comma*) is noticeable, but I do not remember any other point of interest in this family.

I should be glad to hear of any omission I may have made in this list.

E. H. H.

NOTES ON THE ENTOMOLOGY OF KENT.

(*Continued from p.* 59.)

LEPIDOPTERA *(Continued).*

Geometræ.

Urapteryx sambucata, common at Beckenham. *Rumia cratægata*, abundant. *Ennomos tiliaria*, one specimen at Chislehurst. *Crocallis elinguaria*, common at Margate. *Phigalia pilosaria* (Pale Brindled Beauty), one specimen, a male, at Beckenham, February, 1882.

Amphidasys betularia, not rare at Beckenham; the eggs are green. *Boarmia:* I captured a species of *Boarmia*, which I take to be *roboraria*, at Beckenham. *Hemithea thymiaria* (common emerald), one specimen at Beckenham. *Acidalia promutata*, two specimens at Margate, 1881. *Abraxas grossulariata*, abundant; larvæ on currant, &c. *Hybernia leucophæaria*, *progemmaria*, and *defoliaria*, not rare in spring; about the same time also appears *Anisopteryx æscularia*, which I have found at Beckenham.

Chimatobia brumata, very common in the winter time at Chislehurst; the female has no wings. *Eupithecia centaureata*, one specimen at Beckenham. *E. vulgata* (Common Pug), not rare at Beckenham, where also occurs another species of *Eupithecia* of a greenish colour.

Hypsipetes elutata (July Highflyer), not rare. *Melanippe fluctuata*, very abundant. *Camptogramma bilineata*, common. *Eupolia cervinaria* (the Mallow), common at Beckenham; larvæ on mallow (*Malva sylvestris*).

Cuspidatæ.

Platypteryx: Two species have been found in the larval state on birch at Chislehurst; one makes a yellow cocoon, the other a whitish one.

Cilix spinula (Chinese character), one specimen at Chislehurst. *Dicranura bifida*, common in the larval state on poplar trees. The eggs are black; the young larva resembles in shape that of *vinula*, but is reddish, with two yellow patches on the back. *D. vinula*, common. The eggs are reddish brown, and are laid singly or in pairs, either on the leaves or bark of poplar and willow trees; the young larvæ are either nearly black or reddish, and are infested with many parasites.

Notodonta camelina, one specimen at Beckenham. *N. dictæa*, common in the larval state on poplars. *N. ziczac* (pebble prominent), common; larvæ on poplar. *Pygæra bucephala*, common; larvæ on oak, birch, lime, and American oak.

T. D. A. C.

(*To be concluded.*)

OUR "LOOK-OUT" COLUMN.

Notable Flowering Plants of June.—For structure and beauty, Waterlilies and Poppies; for structure, *Fumaria parviflora* and *Corydalis*; for discrimination, *Nasturtiums* (Watercresses) Mustards; for structure, Mignonettes and Milkworts (*Polygalas*); for rarity, Pinks and Catchflies, the latter also being worthy of note as to the physiology of their hairs; for discrimination and hybrids, *Lychnis diurna* and *L. vespertina*; for discrimination, *Arenarias* and Spurreys; for structure, Mallows, Flaxes, Geraniums, all of which will be now in flower, Storksbills (*Erodium*), *Lathyrus* (N.B.—twisting of tendrils), *Alchemilla*, *Cotyledon*; for variation, *Ononis* (Rest-harrow), *Agrimonia*; for discrimination, the *Umbelliferæ*; for neuter flowers, Guelder-rose (*Viburnum Opulus*); for local rarity, the Quinsy-wort (*Asperula cynanchica*); for spurs, Valerians; for study, *Chrysanthemums*, *Senecios*; for beauty, fertilisation, and other interest, *Chlora perfoliata*; Viper's Bugloss (*Echium*), *Atropa Belladonna*; for hybrids, the Mulleins; for variations, *Bartsia*, *Euphrasia*, and for more or less complete parasitism, as also *Rhinanthus*, *Pedicularis*, *Melampyrum pratense*, *Orobanche*; for discrimination, *Thymus Serpyllum* and *T. chamædrys*; for rarity and physiological interest, *Pinguicula lusitanica* and *Utricularia*; for study, Nettles (*Urtica*) and *Parietaria* (Pellitory); for rarity and general interest, *Orchis ustulata* and *O. incarnata*, *Gymnadenia*, *Habenaria*, *Aceras*, *Herminium*, *Ophrys apifera* and *Neottia Nidus-avis*, among Orchids; for beauty, the Flowering Rush (*Butomus*), *Narthecium*; for structure, *Typha* and *Lemna*; for discrimination, some *Potamogetons*, *Scirpi*, *Carices*, and Grasses.

Note.—Very rare plants, most doubtful natives, plants of little structural interest, and those which have been in flower in May, or which will be more generally out in July, have been omitted.

Most Grasses seem to come into flower for the first time either in May or July. The list is necessarily merely suggestive and incomplete. G. S. Boulger.

REVIEWS.

Holmes' Botanical Note Book (London: Christy & Co.).—Now that the botanical "season" is at hand, those who desire aid in examining plants outdoors, as well as at home, will do well to secure Mr. Holmes' *Note Book* without delay. This capital little work comprises a complete and well-arranged Glossary (for use by the student when dissecting and describing plants), sixty blank schedules for practice, an easily comprehensible Chart of the Vegetable Kingdom, including the more important natural orders from a botanical and medical point of view, with a second chart giving the diagnostic characters of all those orders containing plants indigenous to Britain which are not included in Chart I. These—together with directions for examining plants and describing them in the schedules, "Directions for using the Charts," and appendices to the same, and, lastly, a "Floral Calendar," giving the months in which the different members of the orders put in an appearance—make up a most handy and easily portable book for the botanical student, and one which we can cordially recommend.

New Commercial Plants and Drugs. By Thomas Christy, F.L.S. (London: Christy & Co.).—We have received Nos. 1-5 of this useful work, in which many important foreign plants suitable for home-cultivation are described, and figured by means of well-executed litho-plates and woodcuts.

The Scientific Roll (conducted by A. Ramsay, F.G.S.).—Part II. of Vol. I. of this work has reached us, which deals with Aqueous Vapour, and contains a Bibliography and Notes upon the subject.

NOTES AND QUERIES.

Variety of Smerinthus tiliæ.—A fine variety of this species, bred by myself from larva found last autumn, emerged from pupa 23rd April last. The colouring is very curious, green being entirely absent; all the markings, which are usually green, are light burnt-sienna red; the usual whitish blotch at the tip of the forewing is pink; ground-colour is also pink, in places slightly

tinged with grey; underside composed of various shades of light sienna red and pink; thorax and abdomen also of the same colours.

Upper Norwood. FRED. W. FROHAWK.

STAMENS OF VERONICA CHAMÆDRYS.—Among several flowers of this plant from West Drayton, Middlesex, I found a single corolla presenting a curious condition of the stamens. In addition to the (two) normal stamens were two imperfect stamens, one a mere petaliferous lobe or outgrowth, and the other nearly perfect, with a filament and partially developed anther, both filament and anther being attached behind to an outgrowth from the corolla.

In several common flowers belonging to the order Scrophulariaceæ we find the stamens vary in number. Thus, in *Veronica* there are two, in *Digitalis* four (didynamous), in *Scrophularia* four (also didynamous), with a staminode. So, therefore, by adding two stamens to those normally developed, we restore *Veronica* from its diandrous condition, and place it upon a more equal footing with the other members of the order.

My friend Mr. Boulger, to whom I sent a drawing of the corolla mentioned, writes me as follows:—"Your West Drayton *Veronica* is very interesting. I believe *Veronica* is the only diandrous genus in the order; it certainly is in England. Dr. Masters, in his 'Vegetable Teratology,' p. 361, under 'Polyphylly of the andrœcium,' writes:

"'Among normally didynamous plants, such numerical restitution, so to speak, is not unusual; thus in *Veronica* four and five stamens occur.'

"After the mild season we have had I expect that such 'terata' will be plentiful, owing to an increased energy of vegetative growth, but especially phyllody and petalody, as in your leafy stamen (1)." F. J. R.

FLINT IMPLEMENTS.—In the note under this head on p. 36 of this volume of NATURAL HISTORY NOTES, expression is given to an idea which is not a little remarkable. I feel assured that many readers besides myself would be glad to see in these columns any proofs in support of this novel theory which Mr. Ince may be able and inclined to bring forward. Personally, I should be very glad to have an answer to this question—What are the distinguishing features of the "two totally different forms of flint implements?"

If by this the writer refers to the Palæolithic and Neolithic flints, I cannot conceive upon what grounds he proposes to show

that they represent one and the same period, as, apart from the clear and unmistakable lesson taught us by the cave deposits (such, for instance, as those of Kent's Cavern), there is a great dissimilarity of form, surface-discolouration, and, to some extent, of manner of working, in the two classes. Of this, however, every one who has had any experience of flint implements is fully aware.

But, even supposing it could be proved that Palæolithic and Neolithic flints were used contemporaneously, how comes it that in the case of domestic implements, such, for instance, as scrapers, there is a clearly defined difference?

I was under the impression that this matter was put beyond all doubt or question years ago by Sir John Lubbock. Certain it is that no one has done more towards explaining the mysteries of flint implements than the author of "Prehistoric Times."

The following "Science Lectures for the People" contain, in a small way, very interesting information upon the subject:—"Kent's Cavern," "Cave Men of Devonshire," "Our Earliest Ancestors in Britain," and others. GEO. CLINCH.

ACTION OF TENDRILS.—On good authority, tendrils are said to possess the wonderful property of avoiding the stem from which they proceed, when engaged in circumnutating; last summer, however, I noticed a tendril on a branchlet of Meadow Vetchling which had wound itself round one of the leaves near its starting place, plainly showing that the tendril failed to exercise its discretion in this instance. I am not quite certain, but think I have noticed similar lack of selective power in the tendrils of the common Sweet Pea of gardens.

SPIDER AND WEB.—A friend was going into his summer-house one day, and accidentally broke the web of a spider which had been spun within reach of his hat. A few days afterwards he did the same thing again, the web having been carefully repaired; but on a third visit he was surprised to find a small stone suspended by a thread from the web, and which just *cleared* his hat.

To CORRESPONDENTS. — *J. Prior.*—When space permits, "Exchanges" will be inserted free of charge.

A. B. Plant.—We believe there is, but will ascertain and let you know.

J. T. L.—We shall be glad to receive the notes you mention.

W. R.—Thanks for your suggestion, which you will see we have adopted as regards the plants.

NATURAL HISTORY NOTES.

EDITED BY FRANK J. ROWBOTHAM,

(Memb. Geol. Assoc. of Lond.)

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PLANT SYMBOLISM, AS CONNECTED WITH THE EARLY HISTORY OF MANKIND.

BY S. MARSHALL, F.R.Hist.S., &c.

(Continued from p. 72.)

It was our savage ancestor, driven by his struggle for existence to learn the properties of the plants of the earth, to whom we owe the science of medical botany, and in all countries the names of the plants in the language of the people tell us of their real or frequently fancied peculiarities. Some he found out would cure; others would induce or imitate diseases. Some, as the nettle, would seem to produce the rash named after it; others, as some species of *Arum*, would, if bitten, or worse still if eaten, paralyse the tongue and lips, confuse the speech, and finally cause death. These and kindred discoveries the wise man kept to himself, or made his fellows pay dearly for the medicine-man's knowledge. Some of his secrets he kept closely to himself, or if he shared them with another, it was on certain conditions that provided him with a helper or confederate.

He reserved as much as possible to himself the knowledge and use of plants that would produce stupor, delirium, and madness; for by means of them he could produce in himself and others curious manifestations, phenomena so strange and utterly unknown to the community in general that they could only be attributed to divine or supernatural causes.

The *Zuckungen*, or convulsions, temporary madness and ravings that play so large a part in the oracular and priestly ceremonies, and which survive in a mild form, even in Europe, we owe to our savage ancestors. The poisonous properties of plants and the peculiar phenomena which they would produce in the victim were well known to the priest, and so were easily prophesied, while the symptoms could be varied according as the plants were dried, powdered, dissolved in water, or eaten freshly gathered. This was the dawn of the chemistry of botany.

But this early botanist was not an arch-deceiver. He was himself ignorant of Nature's laws, which, indeed, in his savage ignorance, he attributed to the capricious power of terrible gods. With fear and trembling he himself groped to read their will and understand their meaning.

Anything, therefore, of curious form, whether in the animal or vegetable kingdom, he took as a sign from the gods.

Not the objects themselves only, but their minutest internal organs, became symbol or revelation to him. Beasts, birds, reptiles, each and all, living or dying, spoke to him. Their agonies in death, their entrails quivering in the flame or under the knife, the duration of which influenced, as one knows, by atmospheric or other changes, their different states of vitality, muscular irritability, &c., once were or might be of use to him, but which, unnecessary or unknown to the Roman augers, they could afford to wink at and deride—all these became symbol of or message from the dreaded powers.

And there is not a single branch of natural history that cannot be traced back to these early, necessitous searches after that which would lessen man's savage misery, multiply his resources for food, and make the food digestible and more agreeable.

Thus our priest, rain-maker, cloud-finder, astronomer and botanist was the first Editor of Natural History Notes.

We are apt to despise as impostors pure and simple those of our savage ancestors, or their still living representatives in countries as yet uncivilized, who laid claim to extraordinary powers, supernatural gifts, and privileges of direct communication with the gods. In missionary writings we continually meet with contemptuous references to the priests of uncivilized countries. Their replies to the questions of travellers and missionaries, couched in what is now jargon, but what was once symbolical language, has misled many inquirers; but we now deem this language, and the apparently most ridiculous customs and ceremonies, as well worthy of our patient study. The rain-maker and medicine-man is not looked upon as a juggler purposely deceiving those who came to consult him. We see in his way of going to work, in his language, cries, gestures and ceremonies, the germ of the yet infant science of meteorology, while we owe the knowledge of medicine in all its branches, and certainly the sciences of zoology and botany, to him. Laying claim, as he did, to mysterious and supernatural powers, he was obliged to lead a life differing in most things from that of his fellow-men; and living apart, often hiding himself from

them in woods and forests, in caves or savage huts, he had leisure to observe what the warrior and hunter had no time to note. He watched the way of all animals, and learnt their haunts, and cunning methods of entrapping and taming them; he gave them names constantly derived from peculiarities he had observed, and in the same way he named the plants, and thereby imitated a symbolic language which survives to this day in all countries.

It was a matter of life and death to the community that some accurate knowledge of the position and changes of the stars and planets should be possessed and retained among them; it was important to know when to look for and store certain food, when to plant, sow, and gather in any kind of harvest. The stars were the almanac, and every flower was a number in the calendar of the season, and spoke a language of some sort to the eye as well.

The great mysteries of life and death, light and darkness, decay, change, and birth, or reproduction met man at every turn, and he tried to fathom their meanings, and see how far they were connected with natural phenomena, with powers or gods he could control or propitiate.

The great sky was to him the God of Gods, and the sun was to him the child of the great God. The stars, the moon, storms, lightning and thunder, the rainbow, the winds, the sea, and rivers were all gods to him. They were powers he might propitiate, and if he only knew their wishes, he might control them. They were very living entities to him. They had different abodes, for he saw them come and go, die seemingly to rise again day after day, night after night. He knew they could be kind, angry, furious and sulky, or could make themselves invisible. The sun could retire to his cloudy tent, the stars change their courses or hide themselves altogether. The lightning could be a destroying fire, and the voice of the thunder could terrify him. The beautiful and kindly rainbow cheered and consoled him; the capricious, changeful, but generous sea alternately fed or destroyed him. The rivers were raging gods one day, the next laughing, talking, whispering deities, or they would run away altogether, leaving their beds of sand, stones and mud rough and bare, and man to die from thirst. The winds would steal away the life-giving rain and clouds, and the sun then would strike down on unsheltered man with raging, pitiless heat. Man was helpless in the hands of these gods. But Earth and her children the flowers seemed a kindly mother, who would let herself be understood. She gave him plants for food, and in their form, colour, and beauty

they spoke lovingly and gently to him. They could be touched, tasted, handled, planted, sown and reaped. They were useful, easily made into some sort of clothing, or bent, twisted, and cut into tools and weapons. Flowers became a language to man very early, and according to their poisonous, soothing, or nutritious qualities, or possessing in their growth and shape some peculiarities which seemed to tell upon the great mysteries of life, birth and death, he gave them names which then became words and symbols to him of these mysteries. White flowers became symbols of light and innocence, and were worn by and consecrated to virgins. One has but to study the use of flowers as symbol and language on the pyramids and tombs of Egypt and other countries, and the lovely conventionalized floral adornments sculptured on Greek and other temples, to see how great a part flower and plant symbolism played in the early history of mankind.

The Jews, learning this plant symbolism from the Egyptians, took this " wisdom of Egypt " with them, and utilized it as graven, carved, or embroidered language in the construction of their Tabernacle and building of their Temple, and it survives with them and with us all to this day.

Flowers with many golden rays became symbols of the sun, and as the sun was the giver of life and warmth, bringer of fertility, &c., the flowers symbolized stood as symbol-words for these good gifts, and gradually all the mysterious phenomena connected with birth, reproduction, and fecundity were represented in plant, flower, and fruit symbolism.

When the altars in Catholic and other countries are piously decorated with white lilies, which are carried about, worn, and presented to each other by young maidens in the month of May, few of them know that they are perpetuating the plant symbolism of the sun-worship of ancient Egypt. In Catholic countries the yellow anthers are carefully removed; their white filaments alone are left, not, as folks think, that the flower may remain pure white, but that the fecundating or male organs being removed, the lilies may be true flower symbols or visible words for pure virgins; for the white dawn as yet unwedded to the day; for the pure, cold spring as yet yielding no blossoms and summer fruits. So little is this known that I have seen in England ritualistic young ladies decorate the altars of a church with lilies from which they have not removed the anthers, and so they are desecrating and not decorating the altar according to ancient Pagan and modern Catholic

custom, and they would shock the Pharaohs, could they see them, and scandalize Mexico, Spain, and the Pope himself in Italy.

(*To be continued.*)

WROUGHT FLINT IMPLEMENTS FOUND AT WEST WICKHAM, KENT.

It is, perhaps, hardly necessary to spend much time in attempting to describe the form of these curious Palæolithic weapons, as a glance at the illustrations will give a tolerably correct idea of their general appearance.

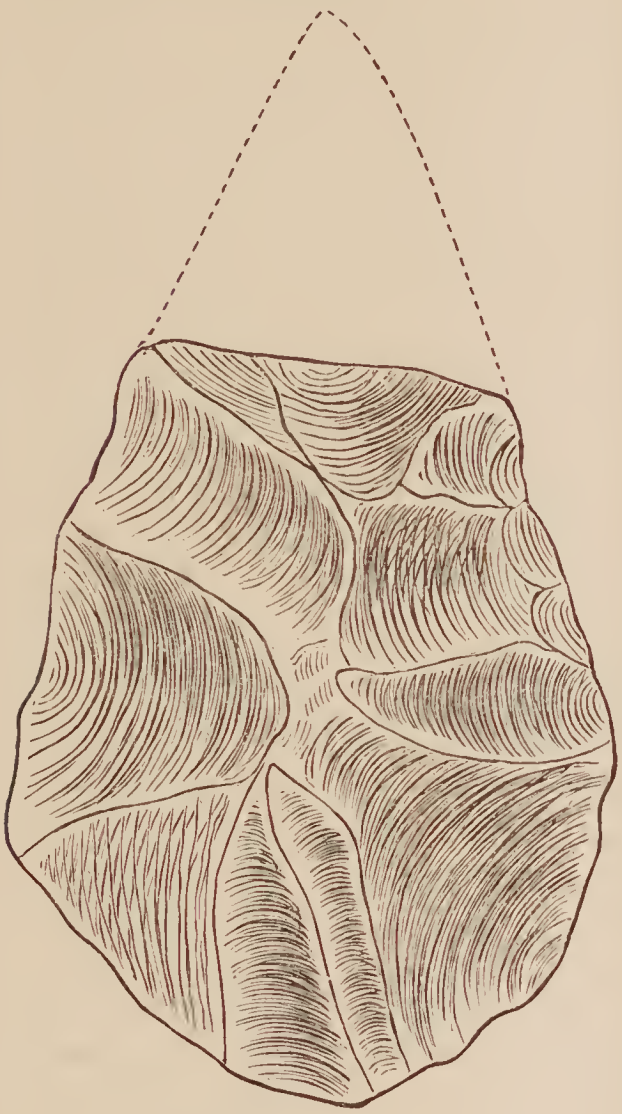

Fig. 1.

Fig. 2

PALÆOLITHIC WEAPONS

(One-half actual size, linear).

It should be mentioned, however, that they are stained to a yellow colour by the ferruginous clay in which they have been so long embedded. Fig. 1 must have been, when perfect, a formidable weapon, fixed (as there can be no doubt it originally was) at the end of a wooden handle.

GEO. CLINCH.

HINTS ON COMMENCING THE STUDY OF BOTANY.

By Prof. Boulger, F.L.S., F.G.S., F.R.G.S.

(Continued from p. 76.)

If any time remains during the winter of the second year's work, it should be devoted to the acquisition of the principles of geographical and geological botany. These are admirably epitomised in Dr. Master's Henfrey. The standard work of reference on the former subject is the Géographie Botanique of Alphonse de Candolle, though the result of much later interesting research is embodied in the late Professor Grisebach's Vegetation der Erde. The distribution of British plants is fully discussed in the Cybele Britannica and other works of the late Mr. Hewett Watson, but in all these works the doctrine of evolution, the key note of modern biology, is virtually ignored. They should, therefore, be checked by the perusal of the vegetable portion of the article Distribution in the new (9th) edition of the Encyclopædia Britannica, which is by Professor Thiselton Dyer, and, if possible, of some of the works there quoted. Fossil botany has not, as yet, been well epitomised. Professor Nicholson, in his Manual of Palæontology (Blackwood), gives a longer sketch of the subject than that in Thomé, and there is a small book on the subject by Professor Balfour (A. and C. Black); but to pursue the subject in any detail, which is quite unnecessary for the generality of botanical students, reference must be made to the works and papers of Lindley and Hutton, Schimper, Heer, Ettinghausen, Carruthers, Williamson, and others. Many of the results of modern research appear in "The Primæval World of Switzerland," by Professor Heer, translated by W. S. Dallas, and edited by James Heywood (Longmans).

Two years' hard work will thus only furnish the student with a good foundation for future study, an accurate possible, though an undetailed view of the field of botanical knowledge.

During his third year the student, who may expect to pass in October such a botanical examination as that in the B.Sc. Degree Examination of the London University, should take as his "guide, philosopher, and friend," Sachs' Lehrbuch der Botanik (Text-book of Botany), translated by Messrs. Bennett and Dyer (Clarendon Press, 31s. 6d.). He can revise his reading of this standard work by using Dr. Vine's Prantl, or Dr. McNab's still smaller *vade-mecum;* but he must now aim at a knowledge of more minutiæ of

histology and physiology, and be able to exemplify his statements by the examination of a greater number of plants. In my opinion a third year's student ought to be able at least to recognise 250 species of the commoner wild plants of his native district. A certain knowledge of chemistry, and considerable manipulative skill in dissection and microscopic examination, ought to be obtained during this third year; and at the present day it will also be advisable to endeavour to go practically through some of the physiological experiments described in Sachs' or in "How Crops Grow," especially such as yield quantitative results. The poverty of English research or literature in this branch of the subject renders a knowledge of German more than ever essential to the thorough student. While Germany supports a weekly "Botanische Zeitung," in England a monthly "Journal of Botany" finds but few supporters. Agriculture, Horticulture, and Pharmacy have each their flourishing periodicals, but pure science can hardly be said as yet to luxuriate on English soil. Besides many interesting works on special topics, such as Hermann Müller's Befruchtung der Blumen durch Insekten, the German language will afford access to Sachs' invaluable "Handbuch der Physiologie." It is probable a mistake for the student to attempt any original investigation at this early stage, partly from the incompleteness of his knowledge of general principles, and partly from the danger that early specialisation of study may narrow his views as to the relative importance of the various divisions of his subject. For the same reasons it is not necessary that the beginner should trouble about conflicting systems of classification. It is now usual to divide the vegetable kingdom into four sub-kingdoms—Thallophyta, Bryophyta, Pteridophyta, and Phanerogamia. The first of these includes the groups popularly known as Algæ, Lichens, and Fungi; but, whilst, as has been before remarked, Lichens are now generally considered as Fungi parasitic upon Algæ, the only distinction between Algæ and Fungi is a physiological one, the presence or absence of chlorophyll, and botanists are, therefore, still in want of a satisfactory classification of this sub-kingdom on a morphological basis. Another difficulty follows immediately in the systematic position of the Characeæ, though at present a considerable consensus of opinion seems content to regard them as Bryophyta, or Moss-allies, modified for aquatic life. Most persons agree as to the limits of Hepaticæ and Musci, though some would remove the Sphagnaceæ (Bog-mosses) from the latter group; as also, among the well-defined

Pteridophyta, some would remove the Ophioglossaceæ (Adders-tongues) and the Marattiaceæ from among the Ferns. Everyone agrees as to the distinctness of Equisetaceæ and Rhizocarpeæ, but in spite of external resemblance many would equally separate the Lycopods and Selaginellas. Though the fossil Stigmaria affords an interesting and probably a linking form, and though there is still much to be learned about the structure of the Gymnospermia, everyone agrees in grouping them among Phanerogamia, as also in dividing the Angiosperms into Monocotyledons and Dicotyledons.

(To be continued.)

NOTES OF GEOLOGICAL RAMBLES AROUND BEDFORD.

(Continued from p. 66.)

The Boulder Clay, which caps the country north of Bedford, is believed to have yielded the main part of the material of which the river-gravel consists. From the wide-spread deposits of gravel and alluvium on which Bedford itself is situated, a great deal of information may be gained respecting the former existence of the mammoth, rhinoceros, hippopotamus, reindeer, &c., in this locality, bones and teeth of these large mammals being frequently met with in digging for gravel ; and with these remains are associated the stone implements and weapons of early man.

In these river-deposits, alone, there is abundant material for the formation of a local museum. In many gravel quarries in the neighbourhood of Bedford an immense quantity of interesting rock-specimens may be obtained, chiefly of those formations, it is believed, which do not occur within the county. Scratched pebbles, which are occasionally found in these deposits, prove the existence of an ancient glacier, which is believed to have "pushed southwards down Lincolnshire from the Cambrian and Scottish hills," and to have brought with it and deposited on melting vast numbers of fragments of rocks from the north of England and Scotland, now forming the gravel of the Ouse Valley, part of which, however, may have resulted "from the droppings of icebergs detached from the termination of such a glacier."

A morning devoted to search amongst these derived rock-fragments in one of the gravel quarries which happily are to be met with quite close to Bedford, will yield a heavy haversack of in-

teresting specimens, worthy in most cases of subsequent study by means of sections or otherwise under the microscope.

Nor are rock-specimens, numerous and varied as they may be, the only good things we may expect to meet with in the course of our search amongst the stone-heaps in these quarries. One shell we shall be sure to find numerous examples of—the Devil's toe-nail, or Cradle-shell, as it is called about Bedford—otherwise the *Gryphæa incurva*, that characteristic fossil of the Lias, together with other species of *Gryphæa* in a more or less worn condition. Rolled belemnites of several species may be also found; nor must the bones or teeth of mammals and reptiles, and worked flints of palæolithic man, before mentioned, be lost sight of in giving a summary of what may be done in a quarry in the Ouse Valley gravels.

These implements are tolerably plentiful, consisting chiefly of scrapers, though axe-heads are occasionally found. I obtained as many as fifteen flakes, scrapers, &c., from the workmen at one pit, together with a beautifully polished bone needle or piercer—the only specimen, I was assured, which had been found there. It measures $4\frac{1}{4}$ inches in length, with a breadth in the middle of $\frac{3}{8}$ of an inch, and is carefully and sharply pointed at both ends. The spot where it was discovered, I was told, was five feet below the surface, "in the solid gravel."

I hope in a future number to be enabled to give a short description of the most interesting rock-specimens which were obtained from these workings.

FRANK J. ROWBOTHAM.

(To be concluded.)

NOTES ON THE ENTOMOLOGY OF KENT.

(*concluded from p.* 81).

LEPIDOPTERA (*Continued.*)

Noctuæ.

Bryophila perla, common at Margate, on walls. *Acronycta psi*, common; larvæ on elm. *A. aceris*, common at Margate; larvæ on sycamore *(Acer)*. *A. megacephala*, larvæ common on poplar, but much infested by parasites. *Hydræcia nictitans*, one specimen at Beckenham. *Xylophasia polyodon*, very abundant. *Mamestra*

brassicæ, abundant; larvæ on cabbage and convolvulus. *M. persicariæ*, not rare. *Apamea basilinea*, common. *Miana strigilis*, formerly common at Margate. *Agrotis*, several species are common. *Triphæna ianthina*, larvæ on primrose at Chislehurst. *T. pronuba*, very abundant, and especially so in 1881. *Noctua augur*, one specimen, Beckenham. *N. plecta* (Flame Shoulder), common at Beckenham. *Tæniocampa gothica*, common at Beckenham. *T. stabilis* (Common Quaker), pupæ at roots of oak. *Scopelosoma satellitia*, one specimen at Beckenham, February, 1882.

Tethea subtusa: I have a specimen which I believe to have been caught in Kent; I have also found larvæ, which I think were of this species, at Beckenham. *Eremobia ochroleuca* (Dusky Sallow): I captured a specimen of this local moth at Margate a few years ago. *Dianthœcia capsincola*, common at Beckenham. *Miselia oxyacanthæ*, two specimens at Beckenham. *Phlogophora meticulosa*, one specimen at Margate. *Hadena oleracea*, rather uncommon. *Dysthymia luctuosa:* I once noticed at Beckenham a number of specimens flying about during the day, somewhat after the manner of the "skippers," but I have not seen any since.

Plusia chrysitis, one specimen at Beckenham. *P. gamma*, very abundant in 1879; they seem to migrate in swarms, for I noticed one evening hundreds of *gammas* flying in the same direction, and next morning there were not a third of the number of *gammas* about that there were on the day before.

Gonoptera libatrix, one specimen at Chislehurst. *Amphipyra pyramidea*, not rare at Beckenham. *Mania typica*, uncommon. *M. maura* (the Old Lady), abundant. *Catocala nupta*, tolerably common.

Micro-Lepidoptera.

Tinea pseudo-spretella, *Stenopteryx hybridalis*, *Pterophorus pentadactylus*, *P. lithodactylus*, and many others.

Coleoptera.

Of beetles worth noticing here, I have found at Margate *Aromia moschata*, *Silpha obscura*, *Blaps obtusa*, and, lastly, that rare insect *Calosoma sycophanta*, a specimen of which I found crawling along near the cliff, about three years ago.

T. D. A. C.

OUR "LOOK-OUT" COLUMN.

Notable Flowering Plants of July.—For discrimination, some Meadow-rues (*Thalictrum*); a rare dye, Woad (*Isatis*); another with noteworthy floral structure, Weld (*Reseda Luteola*); for great physiological interest, the Sundews (*Drosera*); for structure, the Linden (*Tilia*), this year flowering mainly in June; for beauty, glands, and floral structure, the St. John's-worts (*Hypericum*); for beauty, tough bast-layer, and partitions in capsule, the Flaxes (*Linum*); the true Plantagenet (*Genista tinctoria*); for discrimination, some of the species of *Melilotus*, *Lotus*, and *Lathyrus*; for rarity, the Marsh Cinquefoil (*Comarum palustre*); "crux crucium," the Brambles (*Rubus*); for floral structure and physiology subserving cross-fertilisation, the Purple Loose-strife (*Lythrum*); for discrimination, the Willow-Herbs (*Epilobium*), some Sedums (N.B.—the very regular flowers), some Alpine Saxifrages, many of which are rare, and many *Umbelliferæ*, such as *Cicuta*, *Apium*, *Pimpinella*, *Œnanthe*, *Æthusa*, *Angelica*, *Peucedanum*, and *Torilis*; for beauty, the Sea-holly (*Eryngium*); for perfoliate stem, the Thorow-wax (*Bupleurum rotundifolium*); for rarity, *Linnæa*; for discrimination, some Galiums and many *Compositæ*, such as *Erigeron*, *Inula*, *Filago*, *Gnaphalium*, *Anthemis*, *Matricaria*, *Centaurea*, some Thistles, *Lapsana*, *Hypochæris*, *Lactuca*, and—a great crux—some Alpine Hawkweeds (*Hieracium*); for beauty, the Succory (*Cichorium*), and for rarity also *Lobelia Dortmanna*, *Campanula*, heaths (*Erica*), Cranberries (*Vaccinium*), and Winter-greens (*Pyrola*); a saprophyte, *i.e.*, plant without chlorophyll but not parasitic, growing among decayed leaves, the Bird's-nest (*Monotropa*); for discrimination and beauty, the Centauries (*Erythræa*), Water-violet (*Limnanthemum*), and Buck-bean (*Menyanthes*)—N.B. the fertilisation; twining plants (N.B. the direction), the Bindweeds (*Convolvulus*); for the "scorpioid cyme," Houndstongue (*Cynoglossum*), Borage (*Borago*), Alkanet (*Anchusa*), Gromwell (*Lithospermum*), and Scorpion-grass (*Myosotis*), of which latter the species require care; for insect-visitors and the as yet half-investigated details of fertilisation, the Snap-dragons (*Antirrhinum*), Toadflaxes (*Linaria*), and many *Labiatæ*, such as *Calamintha*, *Melissa* (rare), *Scutellaria*, *Prunella*, *Nepeta Cataria*, *Stachys*, *Ballota*, and *Teucrium*; for structure of flower, ovary, and ovule, *Lysimachia*, Pimpernels (*Anagallis*), and Brook-

weed (*Samolus*); for discrimination, Sea-lavenders (*Statice*), which are extremely beautiful on the salt-marshes, Sea-Blites (*Suæda*), some Docks (*Rumex*), most Spurges (*Euphorbia*), N.B. the "latex" and the floral structures, Hornworts (*Ceratophyllum*) and Water Star-worts (*Callitriche*); for root-parasitism, the Bastard Toad-flax (*Thesium*); for remarkable method of cross-fertilisation, the Birthwort (*Aristolochia*); for twining, floral structure, "lupulin" glands, &c., the Hop (*Humulus*); interesting and beautiful Orchids, the Pyramidal (*Anacamptis*), some Helleborines (*Epipactis* and *Cephalanthera*); a Hampshire rarity, *Gladiolus;* for discrimination, many *Alliums*, rushes, *Potamogetons*, *Scirpi*, *Carices*, and Grasses (N.B. just before the hay is cut).

Probably this season not a few of these will flower in the south of England during June.

G. S. Boulger.

REVIEWS.

The Botanical Atlas. By D. M'Alpine, F.C.S., &c. (Edinburgh: W. & A. K. Johnston).—Part I. of this excellent work has been published, and contains four imp. quarto plates, with letterpress, illustrating Chickweed, Maiden Pink, Campion, Fumitory, Wall-flower, Herb-Robert, White Dead-Nettle, and Sage. The correctness of detail and life-like colouring which characterises the four handsome plates, and the useful letterpress description which accompanies each plate, will, we venture to think, serve to place this work on an equal footing with the Biological and Zoological Atlases of the Author, on the plan of which it has been founded. The present work, which is to be completed in 13 monthly parts, is intended to illustrate, by means of selected representative plants, the Cryptogamia and Phanerogamia, the whole to be comprised in 26 plates with accompanying letterpress.

NOTES AND QUERIES.

Helix Cantiana and H. arbustorum.—In April last I took several specimens of Helix Cantiana in a lane near Lincoln. This district is not mentioned in "British Conchology" as a locality

for this species. I also took Helix arbustorum var. Alpestris on the banks of the Witham.

J. T. Lightwood.

Double Buttercups.—As another proof of the "increased energy of vegetative growth" this season, I may mention that a few days ago I met with several buttercups in which the number of petals had been "doubled" at the expense of the stamens—thus 10 petals instead of 5; in some cases the transition from stamen to petal could be observed.

F. J. R.

Plants Found at Hampstead.—Where can I find a list of plants found at Hampstead and neighbourhood? Information would oblige.

F. G. A. Brown.

Bee and Snapdragon.—I noticed the other day a red-hipped bumble-bee, which had just emerged from a flower of Snapdragon covered with pollen, deliberately, by means of his feet, *brush himself clean;* in fact, as Mark Twain says, "shook the dust from his clothes." Now, this cleansing operation, if performed after each of the bee's visits, and before entering a fresh corolla, would, I imagine, sadly interfere with the due fulfilment of cross-fertilisation in the case of the Snapdragon.

W. A. P.

The Zoology of Madeira.—The fauna is not large, and the greater part of it has been imported by human agency. There are few mammalia. Rabbits, of the same species as that found in England, abound among the hills, but are becoming scarcer on account of the absence of game laws, &c. *Phoca vitulina* used to occur some years ago, but it is now extinct. *Mus decumanus* (Brown Rat) is more abundant than is to be desired. Among the birds may be mentioned the Green Canary (the original stock of our domestic breed), which is not rare; the Blackcap, which is the commonest bird in the island; the Kestrel, very abundant; the Robin, not rare; the Grey Wagtail, common Swift, and Herring Gull. These are much commoner than any others; but there also exist the Blackbird, Barn Owl, Quail, Woodcock, Spectacle Warbler, Tern, Goldfinch, and many others. Among the reptiles is a lizard (*Lacerta*), which is very abundant. It is brown in colour, and closely resembles the common British lizard; it lives among the stones and shrubs, and swims tolerably well if

thrown into water; its food seems to be fruit, as I have noticed it licking up the juice which flowed from a ripe loquat (a Japanese fruit); it is probable that it also eats flies. There is also a species of frog with a loud voice. The fishes are numerous; a species of *Beryx* is abundant, and is much eaten by the peasantry. There are also many others of bright colours, which are abundant, and which may be seen to advantage on account of the clearness of the water. There are many mollusca, among which are several of the genus *Helix* and a species of *Volutella*, which is orange and white, with a brown shell. The insects are numerous; among them may be mentioned *Musca domestica*, *Coccus cacti*, *Colias Edusa*, *Vanessa Indica*, *V. cardui*, *Sphinx convolvuli*, and *Plusia gamma*. Among the crustacea are *Homola Cuvieri*, a crab with legs of great length and a comparatively small body, and *Palæmon squilla*, a prawn, which occurs in great numbers among the pools. Among the spiders may be mentioned a large species, the name of which I do no know. It is white, with black bands, and spins its web among the prickly pear plants which abound in the uncultivated land. The silk-like material of which the web is made is so strong as to capture and hold a lizard, for once I found one dead in a web of one of these spiders.

T. D. A. C.

Flint Implements.—In reply to Mr. Geo. Clinch's query about my theory of flint implements, in cases like Kent's Hole, Perthi-Chwarew and Sclaigneaux, there cannot be any doubt of the distinct demarcation between Neolithic and Palæolithic Man; but when, as it is sometimes found, polished and chipped flint implements occur in the same strata it seems to me that the same race have made them, and that "the strata has been disturbed by burrowing animals" cannot hold as a good hypothesis. In the case of Gendron, one flake with some rude pottery was found, about which Mr. Boyd Dawkins says, "M. Dupont's view that they stamp the neolithic age is rendered intenable by the fact that flakes and rude pottery were in use as late as the date of the Roman Conquest of Britain, and are frequently met with in association with articles of bronze and of iron." (*Cave-Hunting.*) Next, in the fields of N. America, Dawson says that there were found many chipped arrowheads with a few smooth arrowheads, which he thinks most likely belonged to Palæolithics, and the smooth arrowheads had been made in time of peace and plenty. Again, in the rock-

shelters, where there are only found bones and rough implements, the date is assigned as Palæolithic; it might be Neolithic, for surely the Neolithics would not leave about their beautifully polished implements which took sometimes years to make, but would jealously guard them till death, when they would be buried with them. In war and in the chase most likely they never used them, except when driven to extremities. Fancy hurling a spear which was the work of a life time! Again, in the case of Bruniquel, human skull and skeletons were found, with the bones of wolf, rhinoceros, horse, reindeer, stag, Irish elk, and bison, with Palæolithic implements of flint and bone, some of the latter having well-executed designs of heads of horses and reindeer; though apparently associated with these, Boyd Dawkins assigns them (the skulls) to the Neolithic period. Thus, though generally the difference is so marked as to be evident, yet no hard and fast line can be drawn between the Palæolithic and Neolithic. At one time Palæolithic must have merged into Neolithic, when the remains could be neither Palæolithic or Neolithic, and one part of Europe must have been populated with savages (perhaps cannibals), whilst the other with more civilized people. And as the age of iron is gradually advancing in the now civilized parts of the globe, so did Palæolithic give away to Neolithic, and Neolithic, in turn, to bronze and then to iron. I may add that I have read some time ago all the books that Mr. Clinch mentions, and advise him to read, if he has not already done so, Dawson's "Fossil Men," and Lartet and Christy's "Reliquiæ Aquitainicæ."

WALTER H. INCE.

NATURALIST'S DIARY.—Can you inform me whether there is a Naturalist's Diary for 1882, and if so, the price, and where it can be obtained?

A. B. PLANT.

THE SHAPE OF THE EYELASHES.—With reference to the flattened and grooved condition of the eyelash, "E. H. H." asks whether, on the theory that this condition was attained through the agency of Natural Selection, it is possible "that such a small variation could really be the destroyer of one race and the maker of another? Is it not," he continues, "more rational to suppose that the flattened shape was *designed* to shade the eye from the glare of unnecessary light?"

"E. H. H." forgets that it is the *sum* of advantages produced by variation which, by the process of Natural Selection, enables the possessor to gain the start of, and finally to supplant, his less fortunate brethren, amongst which the superior form of the eyelash, in affording protection to the sensitive retina, would play an important part in the "survival of the fittest."

Our "Look-out" Column.—With regard to the list of insects which it was proposed to publish monthly, along with the plants, in this column, Mr. F. P. Pascoe, F.L.S., writes: "I thought the Lepidoptera having been done over and over again, and the Coleoptera more or less so, that unless the neglected orders were exclusively considered, it would be of little value. Now those orders require something more than a bare enumeration of species, and the time has not arrived for that. When it does, I think it will be both interesting and instructive."

An Appeal to our Readers.—We would call the attention of our readers to the importance of keeping the "Notes and Queries" column well supplied with records of their "finds" or observations made in the course of their work carried on indoors or in the field. We are always glad to receive and publish such records, and desire to encourage, as far as possible, independent research amongst our readers, in whatever subject or branch of natural science they may take up. The great value which attaches to the results of phenological observance cannot be *too* strongly impressed upon students, and as everything in the broad field of science ought now to be looking up, we most heartily beg of our readers to make the most of the good time before them, and to help to fill the columns of Natural History Notes from the pages of their note-books.

To Correspondents.—*F. G. A. Brown.*—(1) There is a short list of wild plants common at Hampstead Heath given in the *Saturday Half-Holiday Guide*, published by Kent & Co., Paternoster Row, price threepence. (2) See Guide to the Natural History Clubs of London, sold at 97, Westbourne Grove, price twopence.

"Exchanges."—Where space permits, these will be inserted free of charge.

NATURAL HISTORY NOTES.

EDITED BY FRANK J. ROWBOTHAM,

(Memb. Geol. Assoc. of Lond.)

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PLANT SYMBOLISM, AS CONNECTED WITH THE EARLY HISTORY OF MANKIND.

BY S. MARSHALL, F.R.Hist.S., &c.

(Continued from p. 89.)

The whole universe, and especially the world on which they lived, was filled with mystery and wonder to the earliest races of mankind. Their curiosity was excited whichever way they turned, but, as I have said elsewhere, the "beginning of wisdom" to man was not in "the fear of God." "Much knowledge doth not make wisdom," said the ancient Greeks. Knowledge is what must come first, and the beginning of knowledge to man came through something lower than that which we understand by the "fear of God," which to a civilized man, means a sentiment of mixed awe and love. To early man his knowledge began—was born—in fright, in abject terror of the gods, the incomprehensible forces of nature. This terror arose from his having to face and fight with and for that mystery of mysteries to him, his own existence, his own body.

Finding himself on this earth, he must struggle to live on it; and the whole history of man on the globe is the history of this perpetual struggle to prevent the extirpation of his species.

The mystery of his origin troubled him at first but little; he was too miserable and wretched to think of anything but his bodily wants and how to satisfy them; above all how to avoid death; and, as the existence of his family, tribe and race depended on his life, he strove to conceal the strong man's, king's, or warrior's death from his foes; and this led to the various strange

methods of burying, concealing, or embalming his dead. If he could only find a God of Birth or Resurrection stronger than death ! Why should man die and never again return to earth ?

The great god the sun, died, seemed sometimes to be slain, cut in pieces, and his blood reddening the sky ; yet he rose again daily more glorious than ever. Looking at the sun he questioned as to whether he too was not a living man like himself, only mightier than he. It was true that he, like men, rose at dawn, ran his race through the day, and slept, or seemed to die at night. Yet, unlike man, he rose again ever strong and youthful ; not only daily, for a short period, for a lifetime, but perpetually. He was then unlike miserable man ; he was immortal—he could never really die. He seemed to have to labour like himself, and his twelve labours of the twelve hours, or months, seemed to be, as man's labours were, to make the earth more beautiful and habitable. How could this secret of perpetual life, youth and strength be learnt from him ?

Man began to imitate the sun, the golden-crowned king, and to seek for signs of his secret everywhere in animate and inanimate objects. He crowned with gold, or glittering wreath, the head of his hero and king. When the sun-god approached his death hour man saw him lay aside his crown, and, one by one, the glories of his shining locks grew less and less. As long as but one ray was left he lived and was strong. Up into the heaven the one magic ray seemed to rise golden, ruddy. When that disappeared, the sun-god, like the giant Orillo so charmingly described in Ariosto, dropped down dead.*

If the giant sun was strong to run his race, to guide his chariot as long as he had even one hair, a lock or particular group of

* The hero Astolfo has the head of the giant, and is galloping off with it on horseback; he looks eagerly to find the magic hair on which the giant's life depends, and, seeing no one hair differing from another, conceives the happy thought of *scalping* the monster ; the headless giant following him on horseback :—

E tenendo quel capo per lo naso,
Dietro e dinanzi lo dischioma tutto.
Trovo' fra gli altri quel fatale a caso :
Si fece il viso allor pallido e brutto,
Travolse gli occhi, e dimostrò a l'occaso
Per manifesti segni esser condutto.
E il busto che seguia troncato al collo,
Di sella cadde, e diè l'ultimo crollo.

Orlando Furioso, canto 15, st. 87.

curls left, so man would, in his own person, symbolize that, and consecrate his head to the sun-god, and hope to preserve his strength by keeping his head unshaven from birth; for he noticed that baldness meant old age and declining strength, and perhaps the god spoke to him by this symbol. So the many-rayed flowers, especially such as seemed to turn their heads to the sun, from his rising to his setting, must be messenger from the heaven to him; for did they not lose their rays, and wither and look bald when their prime was over? Their white or golden petals were their crown. One by one would men and maidens pluck them off, count by them, seek sign and omen from them of good or ill luck. Sun-flowers, daisies, &c., were so many flower-suns to be questioned. Where the sun was thought to be the one eye of heaven, white starry flowers were given the name of heaven's eye, surviving now in many languages, markedly in our own daisy.

> That well by reason men it calle may
> The Day His Eye or els the eye of the day.

Many flowers besides sun-flowers and daisies stood as symbols of the day and dawn, and of light. When these are rayless flowers as the lily, arum, &c., as a rule there are peculiarities in them that connect them not only with daylight and warmth, but with man's life, with his birth, death, and resurrection.

In the little German book, "The Story Without an End," translated by Sarah Austin, there is the following passage telling on this question. The child is described as gazing down into the flower of the lily :—

"The slender flower waved to and fro, and bowed her pale head with gentle pride and stately modesty, and sent forth a fragrant greeting to him. The child knew not what had come to him; it reached his inmost heart, so that his eyes filled with soft tears. Then he marked how the lily gazed with a clear and steadfast eye upon the sun, and how the sun looked down again into her pure chalice, and how, amid this interchange of looks, the three golden threads united in the centre. And the child heard how one scarlet lady-bird, at the bottom of the cup, said to another, 'Knowest thou not that we dwell in the flower of heaven?' And the other replied, 'Yes, and now will the mystery be fulfilled.' And as the child saw and heard all this, the dim image of his unknown parents, as it were, veiled in a holy light, floated before his

eyes; he strove to grasp it, but the light was gone, and the child slipped, and would have fallen had not the branch of a currant bush caught and held him," &c.

Note the number *three*, sacred to the most ancient as well as the most modern worship, that of Nature and that of the Trinity; also the introduction of the *Johannis-bure*, St. John's berry or currant bush, a sacred plant—symbol of full day or midsummer.

The charming little book from which I have just quoted is full of symbolism of all kinds. But then it is translated from the German, and the Germans have long been faithful earnest students of mysticism, ancient symbolism, and of the sacred books of all countries; while I am startled constantly to find our own so-called educated and even scientific men, and, dare I say it, especially our English clergy, almost utterly ignorant of the beautiful mystical symbolism of mineral, plant, and animal revealed, or "veiled in a holy light" in our English Bible, beneath which lies so much instruction respecting the early history of mankind.

Not only were flowers from the earliest times used as a sort of visible language, but the priests made use of fruits, herbs, shrubs, and trees to symbolize Light, Life, Warmth, and Reproduction. They, the men of science of the day, used these symbols constantly as a sort of secret language between themselves, and, while they taught the people that certain flowers and fruits were to be held sacred as emblems of the Deities and of Life, they did not always give the scientific explanation of why certain plants were consecrated—sacred—and others were unconsecrated or secular symbols.

We have only to read the stone book of ancient rocks, temples, the pyramids of ancient Egypt, the brick tiles of Babylon, the temples and tombs, their carvings and wall-paintings, of all countries, our own Biblical descriptions of the floral adornments of the Jewish Tabernacle and Solomon's Temple, the sculptures of Greece, Etruria, Rome—those too of both the most ancient and the most modern of Christian churches, the mosaics of the catacombs, &c.—to see that savage man's first problems of Nature and first questionings of her as to his destiny, have accompanied him from first to last through all his progress to civilization—his *Fortbilding*, to his decay and disappearance as a race or nation—his *Ruckbilding;* and the floral emblems presented to each other by men and women at the festivals of ancient Egypt, Babylon, and India

are still seen in European carnivals and other sacred festivals and symbolize good or bad luck, birth or death. The Spaniard or Mexican of to-day, the Catholic of Italy and elsewhere, who would feel insulted if you gave a banana to him cut or broken, or if not insulted would take it as an ill omen, a curse indeed in many places, would have found sympathy among the ancient Peruvians, Egyptians, and Babylonians. They would have been distressed at the sacred symbol being broken, and the curious arrangement of the germs or seeds inside the fruit being destroyed or disturbed, symbolizing as they did to them life and reproduction; and the Spanish and Mexican, Catholics especially, seeing the banana with its curious arrangement of the germs cut or broken, would, as the form symbolizes to him Life, the new Birth and Reproduction or Resurrection, have been and are equally troubled, and take it as an insult, ill omen, or curse; while should that same fruit be eaten, divided by the teeth and shared with another, it is held as a sort of communion, an omen of good fellowship and blessing.

The cultivation of the Cucurbitaceæ is of the remotest antiquity. The ancient Egyptians were evidently familiar with every method of fertilizing, crossing, &c., so as to produce countless varieties of the numerous species; and the Israelites on their wanderings might well lament the loss of the melons and cucumbers of Egypt. The dwellers and travellers in hot countries know how grateful to the palate are these succulent and luscious plants. Their great bulk, too, the singular bottle-shaped forms of some, such as the *Cucurbita lagenaria*, the value of this and other kinds of gourd and melon, when properly dried, to be used as bottles, cups, water-jugs, &c., brought most of the species of the Cucurbitaceæ into use at so remote a period that a truly wild species of *C. sativus*, the cucumber, has, it is said, never been discovered by any traveller. The size of some may be imagined when even in Europe the *Poiron jaune* has been known to weigh two hundredweight.

Ages, therefore, before Erasmus Darwin wrote "The Loves of the Plants," and drew attention, in England, to a more careful study of the analogies existing between plant and animal life and growth, the Egyptians seem to have been perfectly familiar with the facts and their metaphysical meanings; and the melons, gourds, and cucumbers were used by man from the remotest ages as symbols of life and fertility. They were used in decorations,

both of broidery and sculpture, and one sees the survival of this markedly in the paintings of some of the oldest masters where the picture of the Virgin and infant Christ are surrounded by borders, not only of the ancient symbolical flowers, but with plants and fruits all symbolizing life and resurrection, or reproduction, and, among such plants and fruits as the fig, the vine, pears, apples, and pomegranates, there figure melons, gourds, and cucumbers.

The fruits and vegetables just named are all more or less symbols of man, his body, and his life. In the earliest, the most savage, and also the grandest and most civilized times of Egypt and other countries, man looked upon his body as the most wonderful and sacred thing created. The various attempts to preserve it by embalming, burial in dessicating earth, a custom still practised by the Carmellites in Sicily and elsewhere, the fond and vain make-beliefs that the dead still lived and ruled by burying them crowned and seated, a practice still in vogue in Abyssinia and surviving among the Greeks, the Greek patriarch being still lowered into the grave in full costume and in a chair of state—all this kept alive man's reverence for his body, and his curiosity concerning it. In Egypt especially, whence we get the greatest numbers of symbols concerning every portion of the human body, the custom of embalming it, the necessary contemplation of the internal organs caused them to be early studied and understood, as we know from the comparatively few rolls of papyrus as yet deciphered.

Our India and other museums abound with carved, graven, or painted images of every one of the principal organs, internal as well as external, of man and some of the animals.

Few things have retarded the study of the natural history of man, of the history of science, and the science of history more than the contempt inculcated by the priests of later ages, the utter scorn for the *vile body* of man.

The exaggerated honour given to it in ancient times, and which at last required to be modified as the ages rolled on, and symbolism degenerated into absolute idolatry and gross worship, led, of course, to a violent reaction. The pendulum swung as much in the one direction backwards as it had been too violently moved forwards.

The beautiful symbolism had really grown to be offensive to good taste, but the study of it is none the less absolutely necessary to a real and scientific study of the whole history of humanity.

(To be continued.)

NOTES ON THE MACRO-LEPIDOPTERA OF THE THAMES VALLEY DISTRICT, BETWEEN MAIDENHEAD AND HURLEY.

By Henry C. Lang, M.D., F.L.S., Member of the Entomological Society of London.

Having for some years past collected lepidoptera in the north-east corner of Berkshire and the adjacent parts of Buckinghamshire, I am able to offer a few notes on the macro-lepidoptera of the district comprised by or bordering on the Thames Valley for about ten miles above the town of Maidenhead. Starting from this town, now so well known to boating men and picnic parties, it will be remembered that the river takes a horseshoe-like course, running due north as far as Cookham, and then turning westward again towards Great Marlow, and afterwards inclining towards the south to reach Henley. Starting from Maidenhead bridge, we have on the right bank the chalk escarpment of Taplow and Clieveden covered with beech woods. On the summit of the cliffs we at once meet with the level tertiary plain of London Clay. On this formation we have a wooded district, including Dropmore (where we are still within sound of the steam launches on the river) ; further inland Burnham Beeches, and further eastward still that once famous entomological locality, Black Park. The whole of this district has a very rich lepidopterous fauna.

On arriving at Cookham the hills recede inland, but to the north there stretches another river-valley, in which are situated the towns of High Wycombe, Wooburn Green, &c. The chalk hills which form the sides of this valley are clothed with miles of beech woods, where many good lepidoptera may be taken, especially noctuæ. After passing Cookham the chalk formation alone is visible on either side, richly wooded on the hills, the trees being mostly beech. The largest tract of wood begins with the well-known Quarry Wood, which clothes the river escarpment below Great Marlow, and stretches inland between Hurley and the open common lands of Maidenhead Thicket and Pinkney's Green. Near to the villege of Hurley, and on the side of the high road to Oxford, is a chalky district, where several local species may be taken.

The best railway stations for this interesting and lovely part of the country are Taplow, Maidenhead, and Cookham.

I will now proceed to enumerate the lepidoptera of the district, beginning, of course, with the butterflies :—

Pieris Brassicæ, *Rapæ*, and *Napi* all common everywhere in most seasons. *Euchloë Cardamines* in the woods. *G. Rhamni* generally common. *Colias Edusa* and *C. Hyale* common in some seasons in the clover fields. *G. Edusa*, especially in 1865, '67, '72, and, of course, '77. *C. Hyale* generally appears at the same time ; var. *Helice* occurred frequently during the last *Edusa* season. *Thecla Quercus* sometimes very abundant at Dropmore, and more sparingly in Bisham woods ; *T. Rubi* ditto. I have never yet met with *T. Betulæ*, which, I should think, ought to occur at Dropmore and Burnham Beeches. *Polyommatus Phlæas* common. *Lycæna Icarus* common ; the variety *Icarinus* (without basal spots on the under side of fore-wings) occasionally occurs at Hurley. *L. Corydon* very abundant near Hurley, but nowhere else. *L. Medon* also at Hurley and open places in Marlow woods, Dropmore, &c. *L. Argiolus* pretty frequent in woods and gardens. *L. Alsus* very local, only at Hurley.

Limenitis Sibylla used to occur in great abundance in Black Park, and has been seen at Dropmore, but not by me.

V. Polychloros common in some years, especially after hybernation. *V. Cardui* in some years very abundant in the clover fields, but generally absent altogether. *V. Antiopa*, one or two specimens have been taken in gardens during the last ten years, and one at Great Marlow. *V. Urticæ*, *Io*, and *Atalanta* generally abundant.

Argynnis Euphrosyne common, but local ; Bisham woods and Dropmore. *A. Selene* very local; only at Dropmore. *A. Adippe* common in all the woods on the Bucks side of the river from Dropmore to West Wycombe; generally very abundant at Dropmore. *A. Paphia* common in all the beech woods ; in some years abundant. *Melitæa Artemis* local, only at Burnham Beeches.

Arge Galatæa used to swarm in one particular meadow in the Dropmore district ; of late years it has not been so abundant, but still occurs. *Satyrus Semele*, only two specimens in 1866 on Maidenhead Thicket, and one at Dropmore the same year ; never seen it in these parts since, though it occurs near Reading. *Pyrarga Mægera* and *P. Ægeria* both common, the latter, of course, in the woods.

Epinephele Janira, *Tithonus*, and *Hyperanthus* all common, the latter in the woods. I have taken the var. *Arete* at Dropmore.

Cœnonympha Pamphilus, of course, abundant everywhere.

S. Alveolus and *T. Tages* both local, but common where they occur, as on Pinkney's Green, open spaces in the Clieveden and Marlow woods, Hurley, &c. *P. Sylvanus* and *Linea* generally common in the lanes and woods. *P. Comma* very local, but common on the chalk near Hurley.

(*To be continued.*)

GEOLOGICAL HOLIDAYS.

No. I.—Aldeburgh, Suffolk.

Young geologists who are deliberating where they shall spend their holidays are recommended to consider the advantages offered by Aldeburgh. It is true that in *variety* of interest Suffolk does not bear geological comparison with Dorset or the Isle of Wight, but in return it has certain unique features of its own, and Aldeburgh is perhaps on the whole the best centre for a short stay.

The formations to be seen are the Crags—Coralline, Red, and Norwich—together with various beds of Pleistocene age, and this part of Suffolk is worth visiting, if solely for the fact that it is the only place where the Coralline Crag of England can be seen. To those who care more at present for collecting fossils than for stratigraphical questions, there is no more favourable formation than the Crag, yielding as it does an enormous number of species of mollusca and polyzoa. And it is not too much to say that although the Crag has been studied perhaps more carefully than any other formation, there are many stratigraphical problems connected with it which are as yet by no means completely solved.

At Aldeburgh we may note :—

(*a*) The Coralline Crag pits to the west of the town, especially those on the Leiston Road, about a mile from the station. These contain numerous Polyzoa, but the Mollusca are usually only casts, except the Pectens, Oysters, Terebratulæ, &c.

(*b*) The Norwich Crag at Thorpe or Sizewell, a mile or so northward, near Mrs. Ogleby's Convalescent Home. The celebrated pit is now filled up, but *Littorina littorea* may still be found, and a few other shells. This place is to be noted as the most southerly exposure of Norwich Crag.

(*c*) The mouth of the Alde ; or, rather, what would have been the mouth had not the Alde been bent southward for about ten miles by a shingle beach accumulated from the north, already referred to in this journal (vol. i., 1881, No. 10, p. 91). Notice

the general direction of the beaches on this coast. (Mouths of Humber, Yare, Alde, and Stour.)

Excursions should be made northward to Dunwich (note the Westleton Beds, Pleistocene, in the cliff, and their resemblance to the Oldhaven Pebbles, and to the present beach at Westleton, if a section for a sluice can be seen), and to Southwold for Easton Bavent cliff, about two miles north of the town, for a good exposure of the Chillesford Clay and Norwich Crag, close to Easton Broad (*Cyprina Islandica* and *Mya arenaria* are very large and abundant here); and also for the Norwich Crag at Potter's Bridge or Yarn Hill, a mile inland from Easton Bavent cliff.

To the south, crossing the ferry, excursions should be made to Iken, Sudbourn, and Gedgrave (near Orford), for the Coralline Crag pits, which are numerous. The historic sections at Gomer, Broom Hill, and Sutton are no longer open. If time permit, the trips should be extended to Hollesley, Ramsholt, Boyton, Sutton, Shottisham, and Chillesford, to see the development of Red Crag, somewhat different from that at Walton; at its base the "Coprolite" workings; and at Chillesford Stack-yard, the Scrobicularia layer, marking the very top of the Red Crag, and the coming-in of northern forms.

Aldeburgh itself offers few attractions other than geological, but it is quiet, bracing, and open, reasonably cheap, and near to London, the Great Eastern Railway granting excursion tickets for a few days at 9s. 6d. third class, and for a fortnight or two months at not much more.

There is an abundant literature on the Crags, although it is not in a form very accessible to the student. The Geological Society's "Journal" should be searched for the writings of the Searles Woods, father and son, and especially for three admirable papers by Prof. Prestwich some years ago. The fossils have been minutely described in several of the Palæontographical Society's publications.

ENTOMOLOGICAL CAPTURES AT SHANKLIN.

Towards the end of May I had a fortnight's holiday at Shanklin, in the Isle of Wight. I was especially struck by what I supposed to be *backwardness* of the foliage; all the trees and hedgerows were leafless, or had the leaves brown and dead. At one place, however, where a large chestnut tree had been partially sheltered, only the exposed upper portion was withered, whilst the lower part

was in full leaf. In fact, the whole island was scathed and sear owing to the severe gales that prevailed in the early part of the month, and which had destroyed nearly all the foliage.

I spent a considerable part of each day in insect-hunting, chiefly along the sea shore. Those who have hitherto only collected inland, will be surprised at the large number and totally different specimens to be found near the coast, especially among the coleoptera. The shore at Shanklin is rather sandy, and has many big stones lying scattered about ; nearly every stone when turned over will disclose an ant's nest, and nearly every nest has its peculiar beetles. In this way I took *Atemeles emarginatus*, the brilliantly coloured *Pæderus littoralis*, and other Brachelytra, *Pterostichus madidus*, the beautiful *Carabus nemoralis*, with its bluish purple reflections, *Silpha opaca*, and many kinds of Stilici, Sternoxi, and Pterostichus, about which I am sorry to say I do not know enough to determine their specific names. The hills, fields, and country lanes also yielded their quota, amongst which was the little weevil *Polydrosus flavipes*, whose splendid golden green elytra sparkled like gems in the sun, and reminded one of the far-famed Diamond beetle of Brazil. *Clytus arietis*, *Timarcha lævigata*, and the blood-red *Apion miniatum* were also to be seen occasionally. Here I first caught the common whirlwig beetle (*Gyrinus natator*) disporting itself in mazy circles on the surface of a small stream of water. At Carisbrooke Castle I found *Blaps mucronata* in one of the disused rooms ; here I was greatly amused by an old lady, who rushed about, guide book in hand, and asked every one she met, "Which was the room where Charles I. was beheaded?"

It was rather too early in the year for many butterflies to be on the wing. A few blues could be met with on warm days, and large and small whites were seen occasionally. *Lasiommata megæra* was common everywhere, and to be found any day flying along the lanes and hedges. I caught one specimen of *Pieris napi*, the Green-veined White. At one place close to the sea I found thousands of *Vanessa urticæ* larvæ, and brought home about 100 in hopes of rearing some varieties, but they have all appeared by now, and one specimen only is slightly darker than the rest. I have also been rearing *Chelonia caja* larvæ with the same object, but none of the imagos which have at present emerged differ in the slightest degree from the normal type.

Among the few moths I took were three new to my collection, the very local *Nola cristualis*, the Speckled Yellow (*Venilia*

maculata), and *Ligdea adustata*. The rest were common ones, such as *Melanippe montanata*, *Hepialus lupulinus*, and larvæ of the Drinker, Lackey, and Oak Eggar moths. The weather was all that could be desired, there being hardly a single day with rain. I might have obtained a larger stock of moths had I worked at all at night, but after setting my beetles in the evening I usually felt too tired for any further exercise, having been on my legs the greater part of the day. CHAS. E. M. INCE.

OUR "LOOK-OUT" COLUMN.

NOTABLE FLOWERING PLANTS OF AUGUST.—Owing to the absence of sunshine, many July flowers, even those of the first half of the month, will go on into August this year. The Sea-heath (*Frankenia*); the Water-worts (*Elatine*), a group of very interesting structure and affinities; the Snowy Pearlwort (*Sagina nivalis*) of Highland mountains, for rarity; the Small-leaved Lime (*Tilia parvifolia*), for discrimination; *Impatiens fulva*, the American balsam, naturalized since 1840 on the banks of the Tillingbourn, Wey, and Thames in Surrey, with flower of curious construction, irritable fruit, and many raphides (plant-crystals); *Ulex nanus* and *U. Gallii*, two Dwarf Furzes, for discrimination; the Fyfield Pea (*Lathyrus tuberosus*), at Fyfield, Essex, for rarity; most of the Rubi in flower and fruit; some Sedums and Saxifrages; Grass of Parnassus (*Parnassia palustris*), most common in the north, for beauty, motile stamens, and glands alleged to be insectivorous, probably nectariferous; Hare's-ears (*Bupleurum tenuissimum* and *B. falcatum*), for rarity, the latter near Ongar, Essex; Samphire (*Crithmum*), *vide* "King Lear;" Danewort (*Sambucus ebulus*), a striking shrub; Teasels (*Dipsacus*), for hooked scales, connate leaves, and alleged protoplasmic filaments to epidermal glands on stem within pitcher (*vide* Francis Darwin, "Journ. Linn. Soc."); Wormwoods (*Artemisia*), Burdocks (*Arctium*), some Thistles (*Carduus*), and Sow-thistles (*Sonchus*), for discrimination; some Heaths (*Erica*); Wintergreen (*Pyrola*); most Gentians (*Gentiana*), for rarity, beauty, discrimination, and possible new species; Dodders (*Cuscuta*), for absence of cotyledons and leaves, parasitic "haustoria," and discrimination; some rare Mulleins, such as *Verbascum Blattaria* and *V. virgatum*; *Scrophularia umbrosa* to be distinguished from *S. nodosa* and *S. aquatica*; the Mints for discrimination (see Baker in "Journ. of Botany," vol. iii., p. 233); Marjoram (*Origanum*), Hemp-nettles (*Galeopsis*),

and some Woundworts (*Stachys*); the rare White Horehound (*Marrubium*) and *Teucrium Botrys*, the latter at Box Hill, Surrey; *Cyclamen* on the borders of Kent and Sussex; Saltwort (*Salsola*); many Chenopodiums, for study; *Salicornia* near the sea, and Sea-purslane (*Obione*); some Polygonums, such as *P. Hydropiper*, *minus*, *Raii* and *maritimum*, for study; Sea-spurge (*Euphorbia Paralias*); *Mercurialis annua;* Autumn Lady-tresses (*Spiranthes autumnalis*), for beauty, perfume, and structure; some Helleborines, especially *Epipactis media* and *E. violacea; Malaxis paludosa;* Arrow-head (*Sagittaria sagittifolia*), for beauty; *Asparagus* in the west, for dicœcism; Autumn Squill (*Scilla autumnalis*); some Alliums; *Juncus biglumis; Eriocaulon*, for distribution; Floating Bur-reed (*Sparganium natans*), for rarity; Galingale (*Cyperus*); *Scirpus triqueter;* and a good number of Grasses.

G. S. Boulger.

REVIEWS.

Half-holiday Handbooks. (London: T. Fisher Unwin).—It is some time ago since we used to refer to the *Saturday Half-holiday Guide* for information and interesting particulars respecting any ramble in the neighbourhood of London which we had in contemplation, and now Mr. Fisher Unwin has presented to the rambling public a more elaborate form of guide in his series of *Handbooks*, which we gladly welcome, trusting that they will acquire the popularity achieved by their predecessor in the field. Although several of these handbooks are devoted to districts in the neighbourhood of the metropolis, Mr. Unwin by no means confines the rambler to so limited a space, as may be seen by referring to the titles of several, such, for instance, as "Dorking and Neighbourhood," "Round Tunbridge Wells," "Round Reigate," &c. Each handbook contains a variety of information, in addition to historic matter, relating to archæology and natural history. As we are mostly concerned with the last-named science, we may remark that as far as our perusal has gone the notes given on the subjects of zoology, botany, and entomology are not only useful, but put in a manner that may be described as "taking," and likely to secure the interest of even the most unscientific rambler. For the geological student there is a special handbook, entitled "Geological Rambles round London," which should form a very valuable guide to him in his excursions.

Wrought Flints Found at West Wickham, Kent.—Mr. George Clinch, in a small pamphlet which he has published on the subject, brings forward some interesting evidence of the former existence of what he considers to have been the habitations of early man in this locality. This conjecture is founded upon the evidence afforded by the discovery, in several acres of ground known locally as "Moll Costen," and adjoining fields, of numerous flint domestic implements and weapons, together with fragments of rude and partially baked pottery, and a quantity of pebbles reddened as if by the action of fire. The pamphlet is illustrated by several interesting forms of the worked flints so found, some of which have been described by the author in the pages of this magazine.

NOTES AND QUERIES.

The Cuckoo.—Is it not rather unusual for the cuckoo to stay so late in the summer as July 10th? Upon that day I heard its song. Last year it remained here until July 2nd. When I was a little boy and went to school I well remember that we used to repeat the following rhyme:—

Cuckoo in April,
Cuckoo in May,
Cuckoo in June,
And then she flies away.

There is another old saying in reference to this bird, which, as it may be new to some readers, I will venture to record here. It is this:—

"The cuckoo eats up all the dirt when the sun shines on both sides of the hedges."

Geo. Clinch.

The cuckoo has not yet bid adieu to its country haunts! Can any one confirm the writer's idea that this bird has been heard in September?

18 July. L. E. A. F.

Birds and their Eggs.—I mentioned last year (Vol. i., p. 50) that I often found empty shells, from which young birds had emerged, at a distance from the nests, but never near them. Lately I have found similar shells, thrush and blackbird, at a considerable distance from the respective nests, and am satisfied that the old birds convey them away so as not to betray their homes. Has any one else noticed this?

Torquay. G. H. White.

A Strange Cabbage.—The other day, when walking in the garden, I noticed a cabbage the outer leaves of which were beginning to send up flowering stalks with buds for flowers. It seemed curious, as they arose from the very centre of the outside leaves. I would ask if any one has observed a similar case, and should be glad to know the reason of it, if possible.

Alfred E. F. F. Huntsman.

Naturalist's Diary.—If Mr. A. B. Plant will apply at Cooke's (30, Museum Street, Oxford Street), or John Van Voorst (1, Paternoster Row, E.C.), they would let him know the price of a Naturalist's Diary. I believe there is one called "The Naturalist's Calendar," by Joseph Merrin (price 3s. 6d.), which contains a list of what may be found each month, and is interleaved with blank pages for one's own notes. There are two or three other Naturalists' Calendars besides Merrin's, particulars of which could be obtained from the above-named publishers, or from Newman & Co. (43, Hart Street, Bloomsbury).

Chas. E. M. Ince.

Plants Found at Hampstead.—F. G. A. Brown will find a list of the flowering plants and cryptogams of Hampstead Heath on page 103 of Dr. de Crespigny's *New London Flora* (Bogue, 1877). The names of about one hundred plants are there given. The short list given in the *Saturday Half-holiday Guide* was not intended for the botanist, but for the "wayfaring man."

July 1. Henry Walker.

Variegated Sycamores.—At Plompton Rocks, near Knaresbrough, this morning, we found a number of variegated sycamores, all grafted trees. The leaves, one of which I enclose, are curiously thin at the white parts. Perhaps it is usual, but I have not noticed this before.

Harrogate, July 18. E. S.

Flint Implements.—I cannot at all agree with the opinion expressed by Mr. Walter H. Ince on page 98 of this magazine, viz., that in cases where "polished and chipped flint implements occur in the same strata" they must necessarily have been made by "the same race." If this kind of reasoning were followed up, we should have an almost endless number of mistakes not merely in archæology, but in geology also. May I be allowed to give as an example an almost parallel case which I have just met with? Very recently I have found at Hayes in some drift-gravel two palæolithic flints. These were lying in proximity with a number of

chalk flints and chalk fossils. Now, if we follow the lines of Mr. Ince's argument, we should be led to conclude that the fossils and the wrought flints represent *one* period, because they are found "in the same" stratum. Surely the most inexperienced archæologist or geologist would know better than this. May not the chipped implements to which Mr. Ince refers have been (as the chalk fossils were) derived from some older deposit? At West Wickham, where I have found a large number of wrought flints, I frequently find palæolithic and neolithic wrought flints lying together, but I have no difficulty in assigning each kind to its proper class. Mr. Ince has favoured his readers with the opinions of some great authorities upon flint implements, but I do not observe that they have any important bearing upon the subject under consideration. The idea of "hurling a spear which was the work of a lifetime" is certainly a very striking one. Would Mr. Ince kindly give any particulars of such a primitive spear, and say where it may be seen? I must confess I have some curiosity to see it. I am glad to find that Mr. Ince admits in reference to the two classes of flint implements—Palæolithic and Neolithic—that "generally the difference is so marked as to be evident." May I venture to remind him that so far he has brought forward no proof of the hypothesis to which he gave expression on page 36, neither has he given his opinion as to what are the distinguishing features of the "two totally different forms of flint implements." I hope he will do so before long.

GEO. CLINCH.

FLORA OF BARNES COMMON.—It may not be generally known that Mr. F. A. Paley, M.A., author of the "Flora of Dover, Peterborough," &c., has recently contributed to a Hammersmith weekly newspaper a "list of nearly two hundred flowering plants collected on Barnes Common, 1877-81." I have before me the cutting from the paper in question, but unfortunately have not preserved the date, although it could be got.

H. W.

TO CORRESPONDENTS.—*A. E. F. F. H.*—The postage of your letter was not prepaid. "EXCHANGES."—When space permits, these will be inserted free of charge.

ERRATUM.—Page 87, line 6 from the top, for *imitated* read *initiated.*

NATURAL HISTORY NOTES.

EDITED BY FRANK J. ROWBOTHAM,

(Memb. Geol. Assoc. of Lond.)

VOL. II. SEPTEMBER, 1882. No. 9.

PLANT SYMBOLISM, AS CONNECTED WITH THE EARLY HISTORY OF MANKIND.

BY S. MARSHALL, F.R.Hist.S., &c.

(*Continued from p.* 106.)

I would urge the student of this subject to as exact and careful thought and speech as may be possible, and not to confound symbolism with idolatry. When the sign is worshipped the idea it signifies is lost; it has, in fact, ceased to be a symbol. Only this week a learned man spoke of the Egyptians *worshipping* the newly-hatched chick, and he said the duckling also figured on the canopies and walls of tombs, the reason of this latter figure—the duckling—being somewhat obscure. Now the ancient Egyptians worshipped neither. The symbol stood to express the idea of birth and life from the mysterious apparently lifeless egg, the chick standing as a letter or language sign for life on the earth; the duckling as life on or from the water.

In our cemeteries we have still surviving conventional symbols which speak to us, but which we do not worship. A broken column says to us, "The eldest son, the prop of the house, has fallen." We do not stop and worship it, for it is merely a statement made visible to us in stone. We do not worship certainly the marble urns so absurdly placed over the modern tombs, and let us hope, hundreds of years hence, we shall not be misjudged by posterity; otherwise some learned men of the day might say as follows: "In ancient England the tea-plant was adored; it was considered so sacred that daily feasts, called *afternoon tea*, were

held in its honour. It was held to be a symbol denoting life and resurrection, a revival from a state of social inanition, deathly exhaustion, to a condition of animation or social life. No family or public gathering was held to be complete without the two sacred vessels called teapot and tea urn being placed on the family altar. Now we know that the English held cremation in great horror, so the urns figuring on their tombs could not denote the inurned ashes of the dead and funeral pall, but were the tea urn and tablecloth used at their family tea parties,—vessels which were sacred to the Deity, adored especially by women, called Godsip or Gossip, and their being placed on their tombs denoted their grief at the close of each day's feast, and its final termination by death."

Symbolism, or visible language, only degrades into a sort of ignorant worship, into superstition, when the learned—the priests—cease to use it, and it becomes, so to speak, the property of the common people, who retain the form but have lost the thought; and when language has ceased also to be a picture, hieroglyph or hieratic tongue, and becomes conventionalized into letters and alphabets.

The common people might look with awe on the triple crown of the Holy Father, and almost worship the rosary, or flower, over which he had made the ancient mystic sign of life and blessing; but the learned see the ancient language of the triple crown, the sign of blessing, the beautiful thought made visible alike in the lily, the uplifted torch of Hymen, or the reversed torch of the genius of death.

As I write this my eye falls on an article, called "The Dance of the Lilies," in the *Daily News* (of July 6, 1882), which tells in a way most interesting to the student of plant symbolism of the connection between plant, stone, architectural, and all symbolism whatever.

The writer describes the feast of San Paolino, the patron saint of Nola, near Naples. After describing his arrival in the little town, he continues: "Our first introduction to the famous *gigli*, or lilies, which play so important a part in the festivities, was obtained during our wanderings through the town. At various points these elegant pyramids, or steeples, or minarets (for they resemble all three) stood awating the morrow's ceremony. They are immense edifices of woodwork (*machine* machines the people call them) tapering to the summit."

Notice the writer's unconscious and valuable use of the words *pyramids*, *steeples*, or *minarets*, and he might have added *pagodas*, *round towers of Ireland*, &c., &c.

"The interlineations of one pyramid were filled in with looking-glass, of another with coloured tinsel mosaic ; all glitter with gold and silver and bright colours. The base of each of these fairy pyramids is a heavy scaffolding of stout beams, hidden by papered frames, and provided with a seat for musicians, whose heads just reach the bottom of the first story of architecture. Behind, the papered frames reach to about the second story, and then the bare scaffolding up to the top is hidden by a very pretty decoration of natural or silvered and gilded leaves and flowers, all pointing upwards, and fluttering with little flags of gilt paper. Candles are also stuck along each cornice, and I counted 120 candles on one of the pyramids. We asked our beggar guide how these pyramids came to be called gigli. He answered that when the people went to meet St. Paolino on his return from captivity they all carried lilies in their hands, and that later, in order to make the commemorative ceremony more imposing, these lilies, or rather their semblance, had gradually been increased in size, and altered to the tall edifices they had now become."

Festivals of this symbolical kind are described by that sceptical, therefore truthful, old historian, Herodotus. The writer referred to above continues, having explained that each trade has its special *pyramid* :—

"The lofty machine advances, recedes, takes a dancing motion in response to the rhythmic jumps of the bearers ; faster and faster plays the band till there is need of rest, and the machine is deposited much nearer the entrance to the square than it was before. Now we hear music and fireworks on the opposite side, and the pyramid of the tailors, in the other portion of the principal street, is on the point of starting. The bearers are all ready, a whistle is heard, and quietly, with one mighty heave, the machine is afloat, as one might say, and commences dancing backwards and forwards. Before it a group of lads and bearers, ready to take their turn, shout and leap and clap their hands, indulging in the wildest gesticulations of joy. Crackers are let off to clear the way, and the mass advances with immense impetus fairly into the square. The face of the man who upheld one of the corners of this giglio was full of pain, as he convulsively grasped with his free hand the

shoulder of a man who walked near him helping to guide; while others coolly smoked cigars the while. There could be no better models for caryatides than these men, and one can understand how ancient peoples could accomplish such enormous works without machinery, when one sees the force and energy of a number of strong men working with one will. Now the giglio of the cheesemongers, which has been waiting quietly in the corner of the square, takes its turn to dance, and the two others can resist no longer; their bands recommence playing, each a different popular melody; the vintners enter the square, and the three tall pyramids not only hop, but waltz round and round on their bases. The tunes are changed to the tarantella, the waltzing of the gigli becomes more and more frantic, the strength of the bearers is exerted to the utmost. And now approach and enter the square, one after the other, the giglio of the bakers, of the smiths, of the *fadolani* (fruit and vegetable vendors), of the butchers, of the shoemakers, and finally an elegant barque, its stout mast surmounted by a Turkish flag. At the prow is a Grand Vizier, or some such personage; at its stern the bust of San Paolino, and a crew of Turks and band of musicians complete its equipment. The Grand Vizier throws *sugar-comfits* among the crowd."

On the sugar-comfits more will be written in this article when referring to wedding-cakes, Christmas plum-pudding, rice thrown after the newly married couple, almonds and sugar-comfits distributed at feasts, and handed round even now to the guests or invited friends at a funeral ceremony.

Botanically speaking, from lilies to onions there is but a short step. Socially and conventionally a leap; for a lady would or might proudly wear a lily who would not venture to have an onion in her bouquet. Yet there is more of what we call sacred and symbolic connected with the onion than even with the lily. In ancient and modern writers we meet with constant sneers at the old Egyptian *worship* of the leek and onion, surviving, by the way, among the Welsh of our own times.

But let us see if the plant symbolism of the onion is not most interesting. Symbols were just beginning to crystallize into letters, and so we are in the dawn of the alphabets when we read the visible language of plants. O N. I. I O. O N. The circle O—the undivisible, endless eternal God-symbol. The round sun, the round or cup-shaped crescent moon, the round and over-arching sky. The perfect All, "Creator, Destroyer, Preserver."

Then the letter N, a symbol almost as sacred as the letter M. The N is made by two triangles, one that which symbolizes flame or fire uprising, the other that which is the symbol of water descending. The letter M includes three triangles, and to this day is a masonic symbol. On that we need not enter now. Fire Water, and Eternity were the threefold early ideas of Deity. Ether, Air, Breath of Life, were symbolized in the word O N and A V M.

Then after the syllable O N, which begins and ends our onion, we have I, or we can take I O ; the old pillar and circle familiar to all students of Egyptology. Lilies and onions have upright, straight leaves, and end in a circular growth, or corm, or bulb, neither root nor leaf to the eye.

So far for the word O N I O N, or O N-IO-O N. There is, as all mythologists know, a world of beautiful symbolism in the form I O. It means Creator, Life, Breath, Spirit, Resurrection, Birth. It was symbolized in the lance or spear-head and bowl buried with the dead warrior. It is symbolized in the spear of Apollo, and in the sword of the priest of Mitra, or Mythra, as he pierces the bull, and from the wound flows the life-blood.

Lastly, there is the symbol of the recurring years and cycles of the earth, the changes of the seasons, and other astronomical changes all made visible word, or symbol language, in the folding leaves of the onion uniting to form the bulb.

(*To be continued.*)

NOTES ON THE MACRO-LEPIDOPTERA OF THE THAMES VALLEY DISTRICT, BETWEEN MAIDENHEAD AND HURLEY.

By Henry C. Lang, M.D., F.L.S., Member of the Entomological Society of London.

(*Continued from p.* 109.)

Among the Sphinges I have taken the following in the district :—

Acherontia Atropos common during some seasons. I have once or twice seen it on the wing in the twilight in the neighbourhood of potato fields. In 1873 I had nearly a dozen larvæ brought to me from the potato fields round Cookham.

Sphinx Ligustri, generally common.

Deilephila Elpenor, not uncommon, comes to light. *D. Porcellus*, rare, at flowers. *Smerinthus Tiliæ*, not uncommon round Maidenhead. *S. Populi*, common. *S. Ocellatus*, only one larva at Cookham, 1872.

Macroglossa stellatarum—in accordance with its usual habits—common in some seasons, and at other times rare or absent.

M. Fuciformis and *M. Bombyliformis*. I used to take both these species at Dropmore, the former abundantly at the flowers of the Rhododendron about the first week in June. They have got much scarcer of late years ; during this season I have not seen a specimen.

Among the smaller clearings I have only taken *Sesia Tipuliformis* and *S. Myopeformis*, both species being tolerably common in some seasons in gardens.

The only Zygænidæ I have yet observed in the district are *Zygæna Trifolii*, which is very rare and local at Dropmore, and *Z. Filipendulæ*, which, though local, is very abundant in suitable localities.

Among the Bombyces (following the arrangement used in Staudinger's Catalogue) I have taken *Hylophila Prasinana* and *H. Quercana* occasionally at Dropmore. *Nudaria senex* and *Calligenia Miniata*, both rare at Dropmore. *Nola cucullalis*, common. *Setina Mesomella*—I found this species literally swarming at Dropmore in 1869, but have never seen it since.

Lithosia Griseola and *L. Complana*, common. *L. Helvola* and *Rubricollis*, both rare, only at Dropmore. *L. Aureola*, once at Sugar, Dropmore.

Euchelia Jacobeæ, not very common ; Bisham Woods, &c.

Nemeophila Russula, sometimes tolerably common in the ferns at Dropmore, Burnham Beeches, &c. *Arctia Caja*, *Spilosoma Lubricipeda*, and *S. Menthastri*, all common. *S. Mendica* and *S. Fuliginosa*, only at Dropmore ; the latter only once.

All the British Hepiali occur in the district, *H. Humuli*, *Sylvinus*, and *Lupulinus* being common. *H. Hectus* more local, but occurs in most of the copses and woods in the neighbourhood.

H. Velleda I have only found in one wood, between Maidenhead and Marlow, where, however, it occurs in great numbers.

Cossus Ligniperda and *Zeuzera Æsculi*, both found in the district ; the former common.

Heterogenea Asellus—one specimen of this rare species was taken a few years ago in Bisham Wood, by the Rev. B. Smith, of Marlow.

Orgyia Antiqua and *Dasychira Pudibunda* are both common; also *Leucoma Salicis* and *Porthesia Auriflua*.

Psilura Monacha is sometimes common on fir-trunks at Dropmore at the beginning of August.

Bombyx populi common, on gas lamps round the town of Maidenhead at the end of November.

B. Neustria and *B. Quercus*, both common. *B. Rubi*, at Dropmore, beginning of June, may be taken flying swiftly in the sunshine.

Lasiocampa Potatoria, common generally. *L. Quercifolia*, only once at light.

Drepana Lacertula and *D. falcula* are both found at Dropmore. *D. Unguicula* in Bisham Woods.

Cilix Spinula is generally common; coming to light.

The Notodonts are fairly represented in the extensive beech woods along the Thames Valley. The Rev. B. Smith, of Marlow, used to be an indefatigable and successful worker at them. It was, I believe, to him that we owed the discovery of *Ptilophora Plumigera* in this part of the country.

Harpyia Vinula, common.

Stauropus Fagi, Bisham Woods, Dropmore, and Black Park, where I took one last year.

Notodonta Ziczac, *Dicteoides*, *trepida*, and *dromedarius*, all occur at Bisham Woods (and I believe *Chaonia*); also *Lophopteryx Camelina* and *Cucullina*.

Ptilophora Plumigera was reared in large numbers by Mr. Smith from specimens obtained in the neighbourhood of Great Marlow.

Phalera Bucephala, common in the larval state. I sometimes take the imago at light at Maidenhead.

Gonophora Derasa, common; some years at Sugar, in most of the woods. Also *Thyatira Batis*; this year they have been scarce.

Cymatophora Or, rare in Bisham Woods.

Asphalia Flavicornis, ditto; *A. diluta*, common at Sugar, in most of the woods in August.

(*To be continued.*)

HINTS ON COMMENCING THE STUDY OF BOTANY.

By Prof. Boulger, F.L.S., F.G.S., F.R.G.S.

(*Continued from p.* 92.)

The next smallest divisions about which there is any general agreement are the Natural Orders as used in De Candolle's "Prodromus," though here individual writers vary considerably, while many botanists, as Braun, Sachs, and MacNab, term them families, grouping many of them together in larger orders. A system much more in use in England is their arrangement into cohorts, once carried out by Lindley, and now adopted, with many changes, by Messrs. Bentham and Hooker in their *magnum opus*, the "Genera Plantarum." This arrangement is likely to be followed by working English botanists for many years to come.

The Candollean families being generally agreed upon, the next question arises as to genera; and it is with reference to this that we first encounter the subjective differences between "lumpers" and "splitters." The one is impressed by resemblances, the other by differences. No general rule can be laid down as to what constitutes a generic character; but, as it is desirable to adhere as closely as possible to a binomial system of nomenclature, the subdivision of genera into sub-genera is a cumbersome addition to the complexity of our classifications; whilst, on the other hand, huge genera, like Agaricus, are equally a source of difficulty.

There is, as has, since the labours of Darwin been generally recognised, an equal absence of any objective test as to specific character; and accordingly it is, perhaps, the simplest method to distinguish by a separate name every variation of structure, which is reproduced by seed, unless it be proved to be a hybrid, or merely temporary sport. This system of "splitting" has the great educational advantage of compelling us to notice the less conspicuous characters, for which reason I consider Professor Babington's "Manual" the best flora for students. In my own practice I generally feel inclined to "lump" genera, as in Sir Joseph Hooker's "Student's Flora," so as to have as few generic names and characters to learn, but to split species, as in Professor Babington's work, thus avoiding the tri- or poly-nomial system of series, sub-species and varieties. It is, of course, a matter of extreme importance that we should notice the influence of external

conditions, such as altitude, proximity to the sea, or to water, poverty of soil, or under or over nutrition, on plant-form.

When the student has made himself acquainted with the native plants within his reach, representing as they will do a considerable variety of orders, he may wish to supplement such dissections as those in Professor Henslow's "Floral Dissections" by the examination of garden or foreign species. To guide him to such work he can hardly have a better book than Le Maout and Decaisne's Descriptive and Analytical Botany, translated by the late Mrs. Hooker (Longmans, 31s. 6d.). This valuable work begins with a short sketch of Structural Botany, but its most useful portion is the Atlas, which contains detailed descriptions of all the natural orders with dissections of one or more species in nearly all of them, and notes as to their useful products often more full than those in Henfrey or Bentley. There is also an important essay, by Sir Joseph Hooker, on classification, giving a grouping of all phanerogams into cohorts. As the "Genera Plantarum" is not yet complete, this is liable to alteration in that work, which the student, especially if dealing with foreign herbarium specimens, will now find invaluable as a book of reference. Three volumes have appeared, at a price of 50s. each, going to the end of the Gamopetalæ, the publishers being Lovell, Reeve, and Co. In large libraries De Candolle's great work, the "Prodromus," can be consulted in its many volumes for the species of flowering plants, and there are, of course, numerous special works on the Floras of various countries, and on the arrangement of various special groups. A brief bibliography of such works may appear later on in these "Hints."

It will be well at this stage, before attempting any original work, that the student should study certain works which deal with some of the wider philosophical questions of biology and botany. First among these is Mr. Darwin's "Origin of Species," an epoch-making work which must effect all the best biological work of our time (Murray, 9s.). Much interesting botanical matter on which the conclusions of this work are based is collected in "The Variation of Animals and Plants under Domestication" (Murray, two vols., 18s.), whilst as supplementing the main argument in various directions, "The Various Contrivances by which Orchids are Fertilized," "Insectivorous Plants," "The Movements and Habits of Climbing Plants," and "The Effects of

Cross and Self-Fertilization," should be carefully perused. Whilst De Candolle's "Géographie Botanique" and Grisebach's "Vegetation der Erde" are rather works of reference and manuals of botanical geography, the wide problems of this subject are pleasantly sketched in Mr. Wallace's "Island Life" (Macmillan).

(*To be continued.*)

GEOLOGICAL HOLIDAYS.

No. II.—The Hampshire Coast.

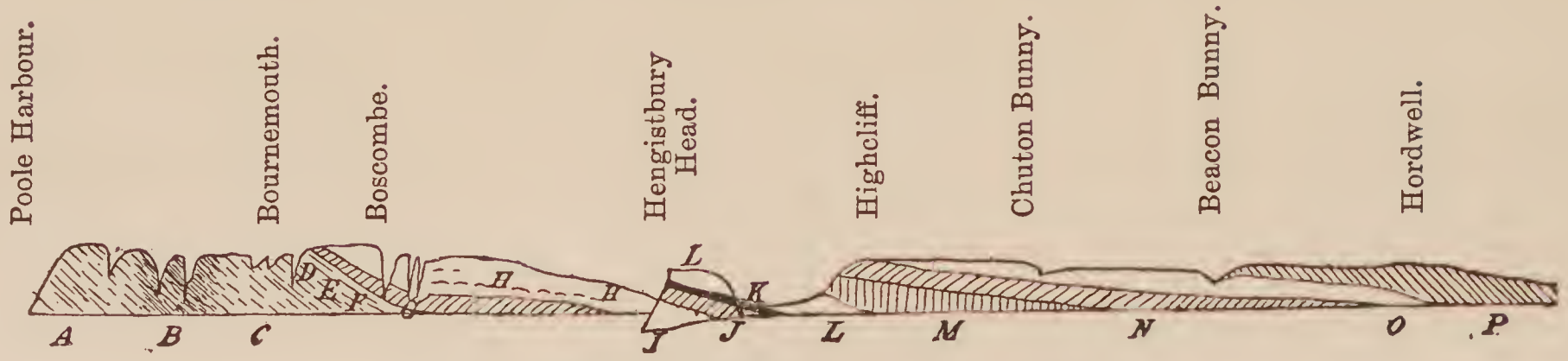
The following brief hints may be useful to those intending a visit to this most interesting area:—*

Between Bournemouth (which forms a good centre for a stay) and Poole Harbour, in the one direction, the Freshwater series with their plant remains may be examined; whilst in the other direction, as far as Hengistbury Head, the marine beds are to be seen and studied. The junction between these two series near Bournemouth should be noticed. Crustacean and Bryozoan remains are to be found in the Marine Bed at Boscombe, S.E. of Bournemouth. Here also the Honeycomb Chines, with their zone of Nipadites, should be noted. These singular chines owe their origin to the action of springs in rapidly excavating deep *cirques* in the soft strata.

Observe the position of the beds at Hengistbury Head in relation to those of Highcliff to the east. The Head is a parallelogram $\frac{3}{4}$ m. long, with cliffs from 50 to 100 feet high, presenting a steep escarpment to the land, further strengthened in pre-historic times by a double rampart. In fine weather the view embraces the coast of the Isle of Wight, from Cowes to St. Alban's Head in Purbeck, displaying the entire Oligocene, Eocene, and Cretaceous series of Hants and Dorset. The stratification of the headland is very marked, and is seen on all sides of it, and in an extensive disused ironstone quarry. The beds are Middle Bracklesham, and correspond with the most brilliantly coloured sands of the Alum Bay series.

* The information is derived from the useful Circular published by the Geologists' Association.

Sketch Section from Poole Harbour to Hordwell. Distance, about 14 *miles.*



A to F, Freshwater Series. G to L, Marine.

A.—Group of clay patches with leaves, without Palms.
B.—Sands and clays, without fossils. Query, ancient river channel?
C.—Plant Beds, with Palms.
D.—Plant Beds, with Aroïds.
E.—Fern Beds.
F.—Marine Bed, with Crustacea and Bryozoa.
G.—Honeycomb Chines, with Nipadite zone.
H.—Boscombe Sands, with Eocene shingle beaches.
I.—Ibid, but ferruginous.
J.—Clay, with green grains.
K.—Clay, with Ironstone.
L.—White sand.
M.—Uppermost Bracklesham Beds, showing passage to Barton Series.
N.—The Highcliff and Barton Series clays.
O.—Barton Series; clayey sands.
P.—Hordwell Beds.

For fossils of the Barton and Hordwell Beds, see the Palæontographical Society's Memoirs. For details of section, consult Works of Reference in list.

In the cliffs between Highcliff and Mudeford the uppermost Bracklesham beds and the Highcliff sands are to be seen, and an abundance of well preserved fossils may be obtained, which, however, need care in packing, owing to their brittle nature. Note the new channel created by the Stour and Avon, which extends for a mile at the base of these cliffs.

By means of exploring the broken undercliffs, the whole of the Barton series, the Hordwell series, and the supposed passage to the Oligocene formation can be studied in detail, and at least the commoner and representative fossils collected.

The following works should be consulted for detailed information respecting the geology of this district:—

Webster, "Trans. Geol. Soc.," ser. 2, vol. 1, p. 90.

Lyell, Ibid, ser. 2, vol. ii., p. 279.

Hastings, Marchioness of, "Rep. Brit. Assoc. for 1847," "Trans. of Sections," p. 63.

Prestwich, "Quart. Journ. Geol. Soc.," vol. v., p. 43.

Hastings, Marchioness of, "Phil. Mag.," ser. 4, vol. vi., p. 1.

Fisher, Rev. O., "Quart. Journ. Geol. Soc.," vol. xviii., p. 65.

In addition to these, the various Monographs of the Palæontographical Society upon Eocene Fossils, including that by Gardner and Ettingshausen, on the Flora, should be consulted; and Papers by J. S. Gardner upon Bournemouth, "Geol. Mag.," April, 1879, p. 148; "Quart. Journ. Geol. Soc.," May, 1879, p. 209; "Proc. Geol. Assoc.," vol. v., No. 2; Ibid, vol. vi., No. 2.

OUR "LOOK-OUT" COLUMN.

Notable Plants in September.—Very few of our native flowering plants blossom for the first time in September. Many linger on from August or even from earlier months. Among these note the furzes. *Ulex Europœus* with its stout and numerous rough angular spines is over by July; in August and September *Ulex nœnus*, with trailing habit, fewer slender and smooth spines, and small pale flowers springing from the spines, and having their wing-petals shorter than the "keel," is in blossom; whilst *Ulex Gallii*, distinguished by strong, deflexed spines and dark flowers with the wings longer than the keel, remains in flower to November. Some flowers, such as Chickweeds and *Sisymbrium thalianum*

flower a second time in autumn, having been already seen in the spring. Among the few first arrivals are two Goose-foots (*Chenopodium glaucum* and *botryodes*), the rare Club-rush, *Scirpus Holoschœnus*, at Braunton Burrows in Devonshire; the equally rare grass *Setaria glauca*, at Weybridge; that tree so interesting to the botanical geographer, the *Arbutus*, native at Killarney, naturalized at Clifton, and common in our gardens; the true Autumn Crocus (*Crocus nudiflorus*) distinguished by its three stamens from the commoner *Colchicum autumnale* of our limestone pastures, which is a Liliaceous plant with six. September is the month for the study of fruits:—

> The thorns and briars, vermillion hue,
> Now full of hips and haws are seen;
> If village prophecies be true,
> They prove that winter will be keen.

Note carefully the distinctive "hips" of the wild roses and brambles. Now, too, much may be done in the study of the Cryptogamia, most of the ferns having been in fruit since the end of July, and fungi being particularly abundant.

G. S. Boulger.

NOTES AND QUERIES.

The Cuckoo.—I remember a saying in Norfolk:—

> May—Cuckoo sing night and day.
> June—He change his tune.
> July—Away he fly.

"The cuckoo will soon be here and pick up all the dirt," was another saying.

The cuckoo was also charged with the unmannerly habit of spitting on the flowers, and producing the froth, popularly known as cuckoo-spit, with which a small insect envelopes itself.

I remember a good many years ago a cuckoo laying her egg in a robin's nest, near the house. The gardener called me to see what a great egg the robin had laid amongst several smaller ones, and was quite incredulous when I said it was laid by a cuckoo. In due time the brood was hatched, with the usual result to the legiti-

mate children, and the gardener, convinced at last, said to me very gravely, "Then I suppose, sir, it's true that the nightingale always sings with a thorn in her breast."

G. H. W.

St. Mary Church, Devon.

Dialysis of Petals in Calystegia sepium.—Whilst skirting the banks of the Thames, not far from Bray village, a few days ago, I observed several specimens of this plant in which separation of the petals forming the usually gamopetalous corolla had taken place more or less completely in each case. In Dr. Master's "Vegetable Teratology," p. 73, *Convolvulus* is included in the list of plants there given, but not *Calystegia*.

F. J. R.

"Love-in-idleness."—I should be greatly obliged to any one who can inform me what flower is referred to in the following lines of Shakespeare:—

> Yet mark'd I where the bolt of Cupid fell:
> It fell upon a little western flower—
> Before, milk-white; now, purple with love's wound,
> And maidens call it love-in-idleness.
> Fetch me that flower; the herb I shew'd thee once;
> The juice of it on sleeping eye-lids laid,
> Will make or man or woman madly dote
> Upon the next live creature that it sees.
>
> "*Midsummer Night's Dream.*" *Act II., Scene* 2.

Geo. Clinch.

Flint Implements.—Flints implements found in the same stratum may not have been *made* by the same race, but certainly they must have been formed at about the same time, or else they would not have been met with in the same stratum (providing that they have not been discovered in alluvial soil). If we say that they do not belong to the same time there could not be any Palæontological certainty, and bones and fossils found in one stratum would be ascribed to another.*

Could not the chipped implements belong to an older deposit? Why should we go out of our way to suppose this? Take a modern instance: In the Zulu war the English fought with nearly

* *Vide* Owen's "Palæontology," and Dawson's "Dawn of Life."

savages, mostly having bone and flint weapons; after some time the worms or other agents would have covered up all traces of the battle, and when some enterprising geologist dug about there, he would find iron and brass mixed with stone and bone, and would directly communicate to some scientific periodical how curiously the implements of such *different ages* were found in the same stratum! Apply this to the implements under notice, could not the Northern British have invaded the southern and fought, leaving about implements of seemingly different dates? The "primitive spear" may not have taken quite a lifetime to make, but should Mr. Clinch try to bore a hard flint with a bit of wood and sand he will find it no joke. Prof. Dawson says that the finished tomahawks of America must have taken as much as three generations to perfect.

I think I must leave the subject here, as the further continuance of the discussion on paper does not appear to me likely to lead to any practical result.

WALTER H. INCE.

"INSECTS IN NORTH LONDON."—Referring to the list of Lepidoptera found in the north of London by your correspondent E. H. H., published in a recent number of your interesting NOTES, which I have only lately had the opportunity of perusing, perhaps I may be allowed to add the names of several species of moths not included in that record, which I have observed in the locality during the last few years.

Arctia menthastri and *A. lubricipeda*, both quite common; *Mamestra brassicæ* and *persicariæ*, also common in gardens, on geranium, ferns, &c.; *Tryphæna pronuba*, is common enough; *Eulepia lucipara* is very destructive to garden ferns, &c.; *Hadena oleracea*, on various flowering plants and shrubs; *H. pisi*, in large quantities on Hampstead Heath, on brake and other ferns; *Plusia gamma*; *Gonoptera libatrix*, one taken at Edmonton; *Odontoptera bidentata*, larva common; *Biston hirtaria* broadly distributed, common in the city squares and by-lanes, also in the West-end Parks; *Hemerophila abruptaria*; some species of *Boarmidæ*; *Camptogramma bilineata*, common; *Halias prasinana*, a larva taken on bramble last season on Hampstead Heath. *Sphinx tiliæ* is not uncommon at Highbury.

All the above-mentioned species I have come across in addition

to most given by E. H. H., with but little searching, and no doubt the list could easily be extended. I hope some other entomologists in the vicinity will add their experiences. It is clear there is no scarcity of species in the northern area of London, and of course the other orders of insects are equally well represented in and near the Metropolis, offering large opportunities for future work in the district.

Allow me before closing to take this opportunity of pointing out two or three misprints in the list given in the February number. *Lignisperda Cassus* should, I believe, be printed *Cossus ligniperda*, and towards the end of the list of lepidoptera the names should read *Liparis salicis*, and *Nœnia typica*.

Highbury, July 28th. W. W.

Habit of Spiders.—I have frequently observed that when a shock of any kind is imparted to the leaves or twigs to which the web of the garden spider is affixed the animal shakes violently in the centre of the web, so as to become almost or totally invisible to the eye, this quivering or dancing motion being kept up for many seconds, and then suddenly stopped. The same thing occurs, I have noticed, when a stick is presented suddenly to the occupant of the web. The reason for these movements, which appear to be effected by the spider in succession pulling the upper portion of the web downwards by means of his strong hindermost pair of legs, and then suddenly releasing it (the natural elasticity of the web greatly assisting the occupier in the execution of these movements), seems to be founded upon a desire on the part of the spider to effect concealment when it feels that danger is near, just as we notice gnats and crane-flies dance rapidly up and down, evidently with the desire of rendering themselves invisible whilst at rest on the window-pane, trusting, no doubt, to their speedy flight and general invisibility for protection when on the wing. F. J. R.

To Correspondents.—*J. Guardia.* Whilst thanking you for the kind expressions contained in your letter, we regret to say that the issue for 1881 cannot be reprinted at present.—*C. F. Worters.* We admit the force of your remarks, but we are unable to give effect to the remedy you suggest. Several newsagents in the City take copies of the magazine.—*G. E. East.* Apply to Mr. R. Damon, Weymouth, for copies of his work you mention, the price of which is stated in the advertisement on the cover.—*W. White.* Thanks for your letter.

NATURAL HISTORY NOTES.

EDITED BY FRANK J. ROWBOTHAM,

(Memb. Geol. Assoc. of Lond.)

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PLANT SYMBOLISM, AS CONNECTED WITH THE EARLY HISTORY OF MANKIND.

BY S. MARSHALL, F.R.Hist.S., &c.

(*Continued from p.* 121.)

The ideas once so simple and beautiful connected with fruit, flowers, leaves, bulbs, &c., received their death-blow from the early Christians, who made use of that most deadly weapon ridicule in their zeal against pagan customs.

Pagan, native or peasant and popular customs have grown to be, as I have said, offensive to good taste, and unnecessary withal. Symbols had become conventionalized into alphabets and letters. There was no longer any need of parading emblems of God, Life, Death, and Birth than there is any necessity for our continuing the old custom of "beating the bounds" now-a-days, when we have maps, charts, plans, printed and exact measurements of every town, village, and hamlet; neither do we require saws and rhymes to fix the calendar in our memories. We have watches and printed almanacs, so that

> Thirty days hath September,
> April, June, and November,

and such rhymes are used only by those who have at hand neither almanacs nor ready memories.

Still one is tempted to regret that the thoughts made visible in melons, figs, cucumbers, pine-apples, and the whole white phrase-book of the lily and its tribe, the onion, of course, included, should have been turned into ridicule, travestied to death, and so have lost their original, beautiful, natural meanings by the use, in

mockery of them, of the turnip, carrot, and other vegetables still figuring in carnival riot, these being most unsymbolical roots.

This most unworthy and slight paper on so fascinating a topic, one which would be a subject for a life-time of earnest study, because it is one that helps us to the proper subject of study, man, his early ideas, dreams, imaginings, gropings after the "*finding out* of God"—this only professes to "twinkle so" that it may "show the way to go" to "the traveller in the dark," humbly showing the way by "its tiny spark."

Those who love and hug their own opinions can, and will, disregard these few remarks, while the true learner will calmly take a spider's thread and use it as a rope, line, and clue to guide him, and he may care to follow it to the dark mine where he may hap to light upon a diamond, the jewel of truth, which, if he be a true thinker, he may delight in as it changes in light, colour, and hue at every turn of its facets to the light.

There are several ways of studying this subject, or rather several branches into which it may be divided. Roughly taken, there are five divisions of the study.

There are, firstly, plants which are symbols pure and simple of the great unknown God, the Heavenly Father, or Heaven-Father.

These are the plants the form, colour, or other peculiarities of which led the priests, the early "thinkers to the community," the medicine-men, magicians, and others, to associate them with the idea of the far-distant, unknown, incomprehensible, and overwhelming, the especially destructive forces of nature.

Such plants became symbols of the great God, the Deity of Deities, the One, the All. They were hieroglyphs, hieratic letters for these ideas. To these visible symbols belong plants such as the lily, onion, flowers of heavenly blue colour, symbolizing the constant blue sky, leaves three-fold or triangular, symbolizing God the Creator, Preserver, Destroyer.

Secondly, the plants symbolizing or suggesting portions or organs of the human body, internal and external, which to the earliest of mankind, and certainly to the Egyptian embalmers, were organs of mystery and importance, such as the heart, the first to beat in the fœtal, and the last to cease pulsating in the adult organism, &c., &c.

To this section belong heart-shaped leaves and petals, and where,

as in the shamrock, there is united the three-fold emblem and the heart-shaped leaf, there is a doubly sacred idea united with the form. To this section belong also the plants and fruits already named—the banana, fig, pomegranate, &c., &c.

The third section comprises plants that were sacred, or *secret, consecrated*, or set apart as secret and sacred, because those who possessed the knowledge of the powers of these plants possessed powers of great importance in ancient or early days over the ignorant and weaker men of the tribe. The plants were supposed to be under the dominion, so to speak, of the good or evil powers. They were the narcotics, the stupifying or the exciting vegetable drugs. The sacred incense in all temples was compounded of these, and have been, and still are, used in all countries ; and as some of these compounds produced extraordinary or deadly effects, as the very dust of the burnt incense when mixed with water and drank brought on a violent and agonizing death, while the fumes might merely produce delightful and enticing exaltation, making men and women eloquent, and seemingly inspired, the knowledge was wisely kept secret from the people, and it was natural that the pains and penalties of death should be held as a threat against those who should indiscriminately imitate, fabricate, or use these drugs. To this section belong the plants used to make the Chinese and Japanese joss to this hour, as well as the tobacco plant, stramonium, and various opiates now become public and public-house property.

The fourth section comprises those plants which in all countries have been noticed to bear some resemblance to parts of the human body, about which there was not much deep mystery and superstition. Such plants were, however, treated as hints or messages from the great Powers to guide us in our lives and help us in our treatment of diseases, and are the plants, the popular names of which meet us everywhere in all countries and in every language. To such belong the tooth-wort, *Lathræa*, *Cotyledon umbilicatus*, or navel-wort ; also the nit-grass, the kidney-wort, tooth-cress, heart clover, lung-wort, liver-wort, pile-wort, and a thousand others. It was the endeavour to find out whether the curious forms, spots, &c., of such plants really indicated their curative powers, that not only promoted the science of medical botany, but which led to the curative powers of other plants being discovered, and to appropriate and suggestive names being in turn bestowed upon such plants, as, *e.g.*,

eyebright, flea-banes, canker-weeds, hunger-grass, stone-break, louse-wort, &c.

Then, in the fifth section of symbolical plants, we come to those which point to a time when symbols were expressed by words or letters, such as the Greek fritillary, which is supposed to have the *woe, woe* written on it, the A I. A I, the flower of grief, of mourning for Thammuz or Adonis, the woe of the world over the dead young spring. In Ireland to-day the *Pteris Aquilina* is called the fern of God or plant of God, because of the appearance of the vascular bundles when sections of the stem are made at different heights or in different stages of growth, the people imagining that on one stem is seen G, on another O, and on the third D, forming the word God.

The Thirty Plants Sacred to the Hindoos.

North Collection, Kew Gardens.

In looking through the valuable collection of paintings recently so generously bestowed upon the nation by the artist and traveller Miss Marianne North, and placed in a building erected especially for the collection by that lady, we see a group of thirty plants held sacred by the Hindoos, and wisely arranged in lines and together, so that the student can conveniently examine them. We will bring a few thoughts on plant symbolism to bear especially on that group.

In the catalogue (311 to 340) it is said that "these thirty plants are often quoted in Sanscrit and other Indian literature. Some of them are used in the sacrifices of the Brahmins, of which the *Soma* is the most important; others supply themes for poets, though it is impossible to understand what they mean without seeing the plants and flowers themselves; others again are valuable in medicine."

Firstly there is the Kuddum or Cadamba (*Anthocephalus Cadamba*), "the holiest of Indian trees."

I have no space here to mention the books, a legion in number, the student must hunt up for himself; nor can I always, save in this list of the thirty sacred plants of India in the group referred to above, give the scientific as well as the popular names. The fruit of the Cadamba is edible, and about the size of a small orange. It is a plant mentioned by Indian and other poets, as are indeed all of these sacred plants, because the true poet loves the study of symbolism in all its branches. The Cadamba grows to a great

size. The capsules are shaped like a ship, *an ark* enclosing the seeds; the ark, the emblem, female, of the receptive and life-preserving powers of nature.

Belonging to the Rubiaceæ and the Tribe Stellatæ, the starry appearance of the flowers made this large plant an especial symbol or emblem of the sun and the starry heavens, while the corolla, being also bell or funnel-shaped, made it a complex symbol of the earth or receptive power of nature.

The Oleander (312), *Nerium Odorum*. Temples are decorated with this plant. It has the colour of rosy blushing flesh. Its name means wet—*Nerbudda*—the river always running. The Greek word is of Sanscrit origin; the people at Broach, in Bombay, called it Nermudda—man—sacrifice? The root of the common Oleander is poisonous, and is called by the natives of Upper India *Hyamarea*, or the horse-killer.

The third in the list of symbol-plants of India is the Bail (*Ægle Marmelos*), belonging to the same natural order as the orange, that of all plants the especial symbol of life and birth. Its leaves, *vide* Miss North's catalogue, which are divided into *three separate leaflets*, are sacred to the Hindoo Trinity, and one of them is doubled up in the turban or sash of a native to propitiate Shiva and ensure safety from accidents. The pulp of the fruit has medicinal virtues. Shiva or Siva is the Destroyer or rather Transformer. Then comes 314, The Sacred Lotus.

No mere magazine article can fairly give the "story without an end" of the Lotus, the *Nelumbium speciosum*, "the most graceful and beautiful of all the water lilies;" for centuries—more than four thousand years ago—it was the emblem of sanctity in Egypt. The plant and the cultus connected therewith have long since become extinct.

The superstitions, however, or dead "dry bones" of once living symbolisms, shake and rattle still, and try to keep up the semblance of form in some countries. It was in India the symbol of fertility. "The mode of propagation is very peculiar and unlike anything else in the vegetable kingdom" ("Life of Sir J. E. Smith," 2, p. 229).

A world of information can be had on the symbolism of the *Nymphea Nelumbo* or *Nelumbium speciosum*, the sacred bean, in a curious old folio with coloured illustrations of various plants published in 1812. It is called "the Garden of the Botanist

Poet, Painter, and Philosopher," by Dr. Thornton. There we get a vivid illustration of the flower and leaf of the plant, and much information concerning the symbolism of the sacred bean. It is a plant living and rising from water. The species of Nymphæas are blue, red, and yellow, the primary colours. The seed vessels and roots are so nourishing that they alone would symbolize fertility. "The Egyptian Ceres holds the seed vessel of the blue lotus in her hand, which the Romans corrupted into a poppy."

Sir W. Jones gives a translation of a Hindoo hymn of the lotus: "The first action of Brahma was the creation of the flower of the Nelumbium." It is delightfully bewildering to wander among the flowery mazes into which this mystical Nelumbian leads one. No wonder that Jack climbing the bean stalk reached the lands of the giant and the golden geese, and yet could ultimately return home and not be hopelessly lost in the land of enchantment and dreams.

It is only when reading and studying the old folio to which I have referred, and all the literature to which the sacred bean has given rise, that one can sympathise with those who find such fascination in the study of symbolism that

> They forget the stars, the moon, the sun,
> And they forget the blue above the trees,
> And they forget where rippling waters run,
> And they forget the chilly autumn breeze;
> They have no knowledge when the day is done,
> And the new morn they see not,

and in fact are as love-sick with study as Isabel was with Lorenzo.

But, as the novel-language has it, "we must tear ourselves away," and turn to another sacred plant.

This is the Champak and its overpowering fragrance. The bee, wise and busy (fussy old thing), wisely shunned it. Like all overpowering and sweet flower odours, it was very *enivrant*, and produced at once languor and exaltation of the nerves. It was therefore consecrated to Vishnu the Creator.

The old "seeker for God" in the sun, or the heavens, or the emblems and symbols for the overruling Deity in sun, moon, and star, of course found an especial symbol also in the Night Jessamine (*Nyctanthes Arbortristis*), 316. These flowers have the very

sweet jessamine odour; they open at sunset and fall at sunrise. It is of course sacred. Juliet would have considered it the right flower to wear for the meeting with Romeo when she says—

Spread close thy curtains, love-performing night, &c.

See Max Müller's essay or lecture on Mythology for interesting references to the powers of Night, to see what the ancient mystics attributed to her. Leaving out the Greek words,—"Night is the mother of Fate and Destruction, of Death, Sleep, and the Tribe of Dreams; the mother of Blame, Woe, and the Evening Stars. She bare also Vengeance, Fate, and Passion, Old Age and Strife," &c.

A strongly and sweetly perfumed night-flower like the Nyctanthes would be sure to be her symbol, and of course the Hindoo and other temples were and are decorated with it.

The Sal or *Shorea robusta*, the flowers of which have a sweetness, often referred to by Indian poets while the resin of this splendid tree was burnt for incense in the Indian temples.

The sepals of the calyx are *five*, and enlarge into *five* large wings. This was for ages a sacred number. It is symbolized in the pentagram which figures as a Pythagorean sign on coins which have a wide geographical distribution. It was on the temple of Delphi symbolized by E (epsilon), the fifth letter of the Greek alphabet. It stood between the two famous mottoes, "Know thyself," and "Nothing too much." It was the symbol for the All,—for God.

"It is well known that the numeral *one*, the undivided, the eternal, is placed in antithesis to all other numerals. The figure *four* included the perfect 10, as $1 + 2 + 3 + 4 = 10$. So 4 represented the All of the universe. Now if we put these together, $4 + 1$ will be the sign of the whole God = Universe."—(*Bunsen*).

Thus of all sacred symbolical plants, those consisting of petals or calyx-sepals, or leaves divided into the number five, are found to be held peculiarly sacred.

In this study, therefore, it is not the names of plants we have to consider alone, but their forms, perfumes, properties, and the numerical arrangements of their parts.

(*To be continued.*)

WHAT IS THE USE OF WEATHER KNOWLEDGE?

By Alexander Ramsay, F.G.S.

There is no intention to give any elaborate answer to this question. Nothing more will be attempted beyond making a few observations that may induce the reader to pursue the subject for himself. There would be no difficulty in arraying a more accurate and extensive series of facts which would make a much stronger case in favour of the utility of weather knowledge than is made out here, but such a treatment of the subject as its importance demands would require a large amount of space.

Every individual has his or her actions more or less controlled by the weather. Unfavourable weather may and does cause delay in the practical affairs of life. In many cases, indeed, it seriously impedes the execution of a task, or even impairs the health. Thus, to take an extreme illustration, the great frost and snow-storm of January, 1881, in the British Isles, put an absolute stop to business in London and in many other places. The loss of time was a serious matter; instances of this could be given by hundreds, but one or two may serve to bring this aspect of the subject prominently before the mind. A vessel was several days crossing from the Thames to the Elbe; and a passenger train on the Great Western Railway reached its terminus four days and twenty-two hours after it was due. These, however, are exceptional cases. Still, in the absence of authentic data and precise figures, it may safely be said that, on the average, at least one minute of time is lost per individual in the course of a year which loss might be prevented by a better knowledge of the weather. A minute a year may be regarded as too trifling a loss to be worth consideration; but when it is considered that the population of the world is, stated in round numbers, about 1,600 millions, the subject may seem more important than was apparent at first. Thus, 1,600 million minutes saved and employed for a useful purpose would result in a clear gain to industry equivalent to the continuously active services of one man for 3,348½ years; or, if we reckon the average day's work from week's end to week's end to be eight hours, to the ordinary work of an individual for upwards of 10,000 years. But the saving of much more than a minute a year has hitherto already been effected by means of forewarnings and forecasts, and it ought to be quite practicable to effect a further saving of much more than a

minute a year by means of such increased knowledge of the weather as is within easy reach of all who wish to learn.

Again, a foreknowledge of weather changes may save great losses of money and of trade produce. For example, in the United States of America, the grain produced in the interior is sent in large quantities to the sea-coast for exportation. If this grain is delayed in its passage, it is liable to serious damage. Such delay often occurs when the roads are in bad condition in consequence of a severe storm. By timely warning the advent of the storm can be sent, and the despatch of the goods be deferred till the weather improves.

And yet again, many lives are lost through the neglect of such precautions as are indicated by meteorological science, even in its present undeveloped infant stage. But there is no need to dwell fully on this part of our answer, as the great importance of saving life is fully recognised. It will suffice for our purpose to refer to the fearful tornadoes of the central United States, against the full, impetuous blast of which the resistance of man or beast is weak and useless. But although man cannot maintain his ground against these winds, which are said to blow at times with a velocity of 500 miles per hour, still, thanks to the devoted services of Sergeant Finley and other members of the Signal Corps of the United States, man is supplied with the requisite knowledge whereby he can prepare to meet the foe, and escape its ravages either by timely retreat or resort to adequate shelter places underground.

THE COLOURS OF FLOWERS.

Mr. Grant Allen, in a very interesting series of papers upon this subject, which have recently appeared in "Nature," has indicated the history of colour-succession in flowering plants, as illustrated by the British flora.

From the evidence here laid before us, we are able to fix upon *yellow* as the primitive colour from which all the varieties exhibited by flowers have been evolved. The chief reason advanced for this theory is that depending upon the origin of petals, viz., whether these organs are to be regarded as modified leaves or altered stamens. Mr. Allen clearly proves the latter theory to be the most tenable of the two; and hence, as most stamens (at least those of the oldest and simplest flowers) are yellow, it would follow that

the earliest petals would be yellow likewise. Taking, therefore, yellow as a starting point in colour, Mr. Allen shows in a most striking manner, and by reference to the flowers of entomophilous, or insect-fertilised plants, how from yellow or white we pass gradually through pink, orange, or red, to purple or blue. Two flowers, amongst many others, are given as instances where this progressive change of tints may be witnessed from the opening of the bud. Thus in the forget-me-not (*Myosotis versicolor*) the petals are pale yellow at first, then pinkish, and finally blue. "One of the wallflowers, *Cheiranthus chamæleo*, has at first a whitish flower, then a citron-yellow, and finally emerges into red or violet."

In all the cases quoted the general direction of the changes is the same. It reminds one of the geological sequence of rocks; though we may note the absence in single instances of one of the stages through which this colour-progression has passed, we do not find any of these stages occurring out of its order or sequence. Thus, for example, the yellow, which Mr. Allen presumes with good reason to be the primitive colour, is never met with following upon the pink or blue stage; but when, as Mr. Allen points out, we see one of the members of a group of entomophilous plants whose characteristic tint is blue or purple (indicating high development) displaying a primitive yellow colour, we may safely regard that member as an instance of retrogression from a more highly developed stage. Further evidence of this is to be found in the majority of cases where both petals and sepals are absent, in the condition of the stamens and pistil, which, by being reduced in number, or, in the case of the carpels, coherent, betoken a fall from a highly modified stage. These plants, too, are generally anemophilous, or wind-fertilized. In the cases of plants possessed of a coloured perianth, Mr. Allen thinks that we observe an instance of retrogression in the first place from a higher state, with consequent loss of petals, followed after a time by a re-progressive movement, resulting, however, not in the replacement of the lost petals, but in the colouration of the calyx-segments. This, too, would indicate a return to entomophilous conditions of existence; and instances are furnished, doubtless, by such flowers as *Caltha palustris*, clematis, anemone, &c., amongst the Ranunculaceæ.

That this succession of colours in plants, culminating in purple or blue in the most profoundly modified members, has been due to the

selection exercised through the agency of insect fertilization, Mr. Allen clearly shows to be the case; for whilst those plants which depend for their due fertilization upon the higher orders of insects, such as bees or butterflies, possess purple or blue corollas, or in the less specialised flowers which depend upon rather lower orders of insects, pink or red, those unspecialised forms which appeal chiefly to the small insect riff-raff would be left yellow or white.

We cannot here go further into the interesting problems and questions which Mr. Allen has raised in connection with this fascinating subject, but must recommend our readers to peruse the papers themselves for full information and details respecting the points we have indicated in this imperfect sketch.

HINTS ON COMMENCING THE STUDY OF BOTANY.

By Prof. Boulger, F.L.S., F.G.S., F.R.G.S.

(*Continued from p.* 126.)

Alike to the student of English botany and to those who take a wider range, the works of the late Mr. Hewett Watson are most important. Chief among them is the "Cybele Britannica," in four volumes, which is out of print, and somewhat scarce. It contains a full discussion of British flowering plants in their geographical relations, the fourth volume being of much interest from a theoretic standpoint. Much of it is epitomised in the "Compendium of the Cybele" (Longmans), and the distribution of each species in the counties of Great Britain is tabulated in "Topographical Botany," originally printed privately, which Mr. Quaritch is about to publish.

To the thorough study of our English flora, some knowledge of its early literature is essential. We have in the British Museum the great Sloane Herbarium, including many plants collected in the seventeenth century, and the botanists of that early time were, many of them, men of great acumen in the recognition of species. Moreover, their plant-names are quoted by Linnæus and Sir James Smith, so that it is important that we should study their writings not only to find out old localities, or early records as bearing on questions as to dates of introduction, extermination, &c., but also to know accurately the plants referred to by Ray, Linnæus, and Smith. Many of these old books are in black letter, most of

them in Latin, and many in bulky folios, which are very scarce or costly. Most persons can only study them in our national libraries; but some of the rarer and smaller works have happily been reprinted. Several of our best living British botanists have derived much valuable information from them, and probably the best method of studying them is the chronological, making MS. indexes, and transcribing copiously points of interest. We may hope to see many more of these books reprinted, indexed, and compared, especially with reference to synonyms and to local records. This is perhaps, however, hardly work necessary to the tyro, nor will unskilled labour in this direction benefit science. The tyro should, however, know something of the history of the science, a subject on which he will find little information in ordinary text books.

Without going back to Solomon, or even to Aristotle and his pupil Theophrastus, who, born B.C. 371, described some 500 plants, classified as trees, herbs, and shrubs, mention must be made of the name of Pedanius Dioscorides, of Anazarba, in Cilicia, whose Greek work on Materia Medica is believed to have been written in the second century. Pliny, the author of the "Historia Naturalis," was born A.D. 23, and was killed in the eruption of Vesuvius in A.D. 79. From the second to the sixteenth century, botany consisted only of commentaries on Theophrastus, Dioscorides, and Pliny, plants being only studied as *materia medica*. Though in the sixteenth century the Dutch may fairly claim the credit of possessing the most illustrious names in botanical science, Brunfels, Fusch, Dodoens, and L'Obel, we in England have reason to be proud of the early date (1538) of the first botanical work of "the father of British botany," William Turner.

(*To be continued.*)

THE ENTOMOLOGY OF MADEIRA.

The entomology of Madeira is very interesting, there being a large number and variety of insects for an island. *Pulex irritans* abounds here, as indeed it seems to do almost everywhere, unfortunately. The Diptera, or two-winged flies are numerous, there are *Culex pipiens* (common gnat), *C. longiareolatus* (mosquito), *Calliphora vomitoria*, *Musca domestica* (house-fly), which is even more

abundant than in England ; and many others. Among the Heteroptera are *Pentatoma rugipes*, which may be found on the leaves of the "sweet potato." *Lygæus equestris*, a red and black insect which occurs only on a species of willow, and a few others. Among the Homoptera may be mentioned several species of aphides, among which are the green rose aphis, and a yellow species which lives on the willow-like plant before-mentioned, with the *Lygæus*. There is also the cochineal insect (*Coccus cacti*), which has been imported, but is not cultivated ; it feeds on the Prickly Pear (*Opuntia tuna*). We now come to the Lepidoptera; the Diurni, or Butterflies are not numerous. There are, however, *Colias edusa* very abundant ; *Vanessa Indica*, a species resembling the Red Admiral, but somewhat different in its markings, the caterpillar of which lives on nettle ; *V. cardui*, not rare ; *A. satyrus* and *Polyommatus Bœticus*, which is abundant. Among the Nocturni are *Acherontia Atropos*, rather scarce; *Sphinx convolvuli*, abundant, the larva of which is said to feed on the "sweet potato;" *Deilephila euphorbiæ*, the beautiful larvæ of this insect may be found in abundance on the sea-spurge, the young ones are black ; when kept together in confinement they kill one another ; *Macroglossa stellatarum*, abundant ; *Deiopeia pulchella*, which flies about during the day ; and a few others. Other Lepidoptera are *Plusia gamma*, abundant ; *P. auriflua ;* another species of *Plusia ;* a plume moth (*Pterophorus*), and *Stenopteryx hybridalis*.

The Orthoptera are not very numerous, but some of them are of very bright colours; there are *Forficula auricularia*, *Blatta Maderæ*, *B. decipiens*, *Acheta domestica*, *Decticus albifrons*, *Œdipoda migratoria*, &c.

Among the Hymenoptera are *Apis mellifica*, a *Pœlopœus* (Mason Bee), *Polistes gallica*, *Œcophora pusilla*, a small ant, which lives in the houses ; a species of *Ophion*, and a number of other species. The Neuroptera are not numerous ; a *Cloëon* and a dragon-fly however occur commonly.

Five hundred and fifty-five* Coleoptera are said to occur ; I have noticed a species of Coccinella (Lady-bird), which is also found in England.

T. D. A. C.

* 580 in Wollaston's "Catalogue" (1857) ; more since.—Ed.

METROPOLITAN SCIENTIFIC ASSOCIATION.

Extract from Report for the Session 1881-2.

The Council have pleasure in presenting the members with the fifteenth annual report of the work and condition of the Society.

The opening meeting took place on the 11th October, 1881, and during the session the following interesting and valuable papers have been read :—

"Evolution considered in reference to the Marsupialia," by the President, Mr. W. H. Davis.

"The Application of Embryology to the Theory of Evolution," by Mr. G. A. Cole, F.G.S.

"Protococcus Pluvialis," by Mr. J. D. Hardy.

"Dentine, and the Structure of Teeth," by Mr. W. West, L.D.S.

"Notes on the Establishment and Keeping of Marine Aquaria," by Mr. J. W. Worster, L.D.S.

"Spectrum Analysis," by Mr. A. W. Bawtree.

"The Sense of Pain in Fishes," by Mr. C. S. Bentley, F.S.A., F.R.M.S.

"Electrical Resistance," by Mr. H. G. Moberly.

"Micro-Illumination," by Mr. J. D. Hardy.

It has been a matter of much regret that through the want of a permanent record of the many highly instructive and interesting papers which have hitherto been read before the Association, the value of them has been generally lost to members present after being once read, and entirely lost to those members not present. Your Council therefore have great satisfaction in announcing that they have arranged with the Editor of "Natural History Notes" to publish the Association's proceedings in a very advantageous manner, four pages of that Journal being placed at the entire disposal of the Society monthly throughout the twelve months of the year, and the members are asked to cordially co-operate in a matter of so much benefit to the Society, and also to themselves, by subscribing two shillings annually towards the cost of printing (which, together with the sale of extra copies, will, it is estimated, cover same), in return for which they will receive a copy monthly, and thus have a continual and lasting record of the papers and

transactions. By a resolution of the Society, associates will have a copy of the proceedings forwarded to them without any further charge beyond their annual subscription.

June, 1882.

PROCEEDINGS.

"A Scotch Volcano, Burntisland, with Notes on Arthur's Seat."* By Mr. G. A. Cole, F.G.S.

Burntisland, situated on the northern shore of the Firth of Forth, was visited by the author in the course of a summer ramble, and its geological structure and relation to surrounding areas carefully explored and noted. The present paper embodied these observations, and by a rigid comparison with the principal European seats of existing volcanic activity, Mr. Cole was enabled to make it evident to his hearers that in Burntisland we have an old volcanic cone of the calciferous sandstone or lowest carboniferous period. In the earlier portion of his paper the author expressed an opinion that such immunity as we—in Britain—now enjoy from earthquakes and volcanic action is due to our now passing through a period of comparative rest, and by comparison adverted to the striking visitations of vulcanicity which during the Miocene period were exhibited in Antrim in Ireland, and Mull and Skye in Scotland. The method of determining the age of volcanic rocks by intrusion and interbedding, together with the difficulties appertaining thereto, was well illustrated by diagrams on the blackboard, and the structure of a common volcanic cone was also well shown by large drawings of the Kammerbühl, whose structure is well known from borings made by Count Caspar, at Steinberg, in 1837, and by views of Vesuvius, Santorin, &c. The relations of these to the Scottish problem was pointed out, and the absence of cone features in the latter case shown to be due to long-continued denudation. Specimens of the ash beds scoriæ were exhibited, together with some interbedded lavas and amygdaloidal basalts, and the gradual passage in rock-structure from the external lava stream or dyke to the great crystalline gabbrolitic mass that underlies both Burntisland and Arthur's Seat was made manifest. But the most interesting fact is the similarity between the igneous products of such old date and those of modern times, as Prof. Judd has pointed out. The Scotch palæozoic volcanic district erupted acid lavas

* Abstract of a paper read 10th May, 1881.

before the basic lavas were given out; so again did this law hold good in Miocene times, and in many instances of comparatively recent periods the same relation has been observed. And, looking at the question in a still wider view, it would almost appear as if, in the earlier portion of a geological period, the volcanic activity was exhibited by the eruption of lavas of a highly silicated or acid character, and the later portions by those of a basic character. Does this in any way show that the earth is subject to internal periodicity in volcanic action?

OUR "LOOK-OUT" COLUMN.

Botanical Work for October.—Except in unusually backward seasons, every species of British flowering plant has come into blossom before the beginning of October. The Bistort (*Polygonum Bistorta*), a beautiful aquatic, flowers for the second time this month, and some two dozen plants remain in flower. Some of these are those commonly spoken of as flowering all the year round, *i.e.*, from February to October, such as *Capsella Bursa-Pastoris*, the Shepherd's Purse, the Daisy, and the Dandelion. Perhaps the only species that does flower from January to December is the Groundsel (*Senecio vulgaris*). The other plants now in flower represent fifteen natural orders, which can, therefore, yet be studied. They are *Ranunculus hirsutus*, *Sisymbrium thalianum*, *Silene Anglica*, *Ulex Gallii*, *Lythrum hyssopifolia*, *Parnassia palustris*, *Senecio squalidus*, *Carlina vulgaris*, *Arbutus unedo*, *Solanum nigrum*, *Linaria Cymbalaria*, *Calamintha sylvatica*, several species of *Atriplex*, *Polygonum Persicaria*, *Colchicum autumnale*, and *Alopecurus agrestis*. In a moist mild autumn, *Chlora*, *Gentiana amarella*, and even *Campanula glomerata* may still be found in blossom.

Out of nearly fifty British species, only ten ferns are now in fruit, the common Polypody (*Polypodium vulgare*), Ceterach, and English maiden-hair (*Asplenium Trichomanes*), and the rarer *Asplenium viride*, *marinum*, and *septentrionale*, and *Trichomanes radicans*, the Killarney fern. They mostly fruit between June and September. Their allies the Horse-tails (*Equisetum*) are still earlier, ranging in fructification from April to August. The *Lycopodiaceæ*, or Club-mosses, fruit between June and September, the genus *Chara* from June to August, and its related *Nitella*

from April to September. Mosses are most abundant in fruit from now to February, and the *Jungermanniæ* mainly from December to February. *Algæ* can be well collected whenever we are at the seaside, which is generally earlier in the autumn, *e.g.*, August and September, and Lichens, though well represented now, are still better studied from November to February. Leaving then the Algæ for a time, and the Lichens, *Jungermanniæ*, and Mosses for November, December, and January respectively, let us now note some typical fungi, taking as our guides Mr. Berkeley's Fungology, Dr. Cooke's Microscopic Fungi, and their joint work in the International Scientific Series. With a powerful microscope we can at any time examine *Bacteria* in an infusion of hay exposed to the air for a day or two, or *Saccharomyces*, the Yeast-plant, starved into fruiting on plaster-of-Paris. *Mucor*, the common Mould, is generally procurable, and with it will be found *Penicillium*. The Salmon-disease, *Saprolegnia ferax*, can be also found on Carp and Gold-fish, and, at this season, *Empusa muscæ*, a related form, fastens flies to window panes. It is too late for Potato disease (*Phytophthora*), but some *Peronosporæ* may yet be found on other plants. *Æthalium septicum*, "flowers of tan," found in tan-pits, is the commonest representative of the problematical *Myxomycetes*. It is late for Truffles in a wild state. The fallen leaves of Sycamore are blotted with *Rhytisma acerinum*, and some *Pezizas* may now be found to further represent the *Discomycetes*. The orange or white cup-like "æcidia" of many of the *Uredineæ*, or Rusts, may now be seen on leaves and branches; but the group of the season is the *Basidiomycetes*. *Tremella*, *Geaster*, and *Lycoperdon*, the two latter being *Gastromycetes*, may be found; but the common mushroom (*Agaricus campestris*), the Fly Agaric (*Amanita muscaria*), *Clavaria*, *Hydnum repandum*, *Polyporus*, *Boletus edulis*, the *Russulas*, and the Chantarelle (*Cantharellus cibarius*), afford abundant examples of the *Hymenomycetes*.

G. S. Boulger.

NOTES AND QUERIES.

Pit-Dwellings.—In the April number of Natural History Notes I see that Mr. Clinch invites readers to help him to elucidate the nature of, and causes which may have produced, the so-called "pit-dwellings" of Hayes Common, and to contribute in-

formation of similar structures. Without attempting to account for their origin, the following notes may be of interest to him :—

At Worm's Heath, near Warlingham, in Surrey, distant only about four and a half miles in a S.S.W. direction from Hayes Common, several pits occur, but of a character differing somewhat from those he mentions. They are excavated in the Oldhaven Pebble Beds, and vary greatly in size, the larger being from twenty to thirty yards in diameter, and rather over twenty feet deep, others being only a few feet across, and of proportional depth. The material removed lies in an irregular ridge round the margin. They seemed to be rather elliptic than circular, the longer axis stretching north and south, but not having an opportunity of measuring them accurately, I cannot vouch for the absolute correctness of this impression. Both ridges and pits are turfed over, some of the latter containing a most luxuriant growth of brake and heath. H. W. Gilbert.

Notes on Bees, &c.—A room in my house is being painted, and I told the man who was at work that bees would come and work also, but he thought it unlikely that they would find anything they wanted in fresh paint. The mixture was linseed oil, turpentine, white lead, and blue-black. Presently two bees flew in; one set to work on the window-frame (white paint), and flew away slightly loaded with some of the mixture in its pollen baskets; the second attacked the grey paint of the window-sill, and loaded its thighs heavily. Years ago I saw bees load themselves with *putty*, instead of pollen, in the early spring. This morning bees are flying in and out of my room in an angry manner; the paint being dry, they cannot get what they want. So much for insect life. Would it interest your readers to know that I have seen a sitting hen, when deprived of her eggs, take to herself several pieces of coke and arrange them carefully? I have also seen a sitting hen take possession of a small basin and brood over it, the basin, of course, being inverted.

Belstone, September 6. Margaret James.

"Love-in-Idleness."—Culpepper, in his "Herbal," denotes this flower to be the pansy, for he says: "It is also called by those that are more moderate three faces in a hood, love in idleness, cull me to you; and in Sussex we call them pansies."

E. S.

"Love-in-Idleness."—Shakespeare—"Taming of the Shrew," Act. I., Sc. 1; "Midsummer Night's Dream," Act II., Sc. 2. See "The Plant-Lore and Garden-Craft of Shakespeare," by Rev. Henry N. Ellacombe, M.A., under the word *Pansies* (p. 151). "The other name, Love-in-idle, or idleness, is said to be still in use in Warwickshire, and signifies love in vain, or to no purpose."

St. Mary Church, Devon. G. H. W.

Natural Drain Pipe.—At the edge of a little wood close to Granchester Church, near Cambridge, one of the principal branches of the root belonging to an old tree stump projects through the bank into the road. The inside of both stump and root having rotted and disintegrated, the latter forms a very perfect natural drain pipe, eight feet in length, which conducts away the water collecting in the stump during rainy weather.

Trin. Coll., Cambridge. J. R. Davis.

Habit of Spiders.—With reference to my note on the above subject last month, the following interesting letter has appeared in "Nature" for September 7th. Speaking of the shaking of the web by the spider, the writer says: "I am inclined to think it does so from a feeling of anger. During a long residence in the tropics, I often amused myself irritating spiders and watching their conduct. I noticed that they generally seized the web and shook it up and down in the manner described by your correspondent, but some of the spiders were of so great a size as to render concealment by such a manœuvre quite hopeless, and I attributed their behaviour to other motives. They appeared to me more to resemble angry monkeys than anything else. I have not unfrequently seen the latter when annoyed jumping up and down on all fours with their tails erect in the air, or if confined in a cage, seize the bars by their hands and feet, and shake them as the spiders did their webs." F. J. R.

Natural History of London.—Migration of Queen Ants.—It is a not uncommon sight, I believe, especially in the suburbs of London towards the end of the summer, to see winged female ants alight on the paved footway, and detaching their wings, run over the hard surface, seeking in vain for a suitable spot to found a new colony. To see, however, a batch of young queens taking their departure from the London flags is by no means a common sight. Such a one, nevertheless, I witnessed on

the 4th September last, when passing along West Cromwell Road at about 4.15 p.m. The formicary was beneath the flags on the northern side of the road, and midway between Nos. 20 and 22. There were two entrances to the nest, between the chinks of the pavement, and situate about two or three feet apart. Through one of these openings the migrating queens, some eight or ten in number, had emerged, attended, as is usual in such cases, by a crowd of workers who were fussing round them, adding the finishing touches to the toilets, and doubtless giving the last parting words of ant-advice to their quondam charges. Next morning everything was quiet again, and had it not been for the above-named incident, I doubt if my attention would have been called to the little colony. The ants were small and black, but with the name of the exact species I am not acquainted. B. B. W.

Evolution or Devolution?—The "*Dahlia viridiflora*" began producing regular green flowers this year, as in duty bound, but of late it has been wandering very much, perhaps in search of its ancestral type, sometimes inserting a purple petal in a bloom, at others giving a green centre with a regular purple fringe. I suppose *D. viridiflora* may have been originally a "sport" from a purple dahlia, and feels a hankering after its primeval state. Query: Is this evolution or devolution?

St. Mary Church, Devon. G. H. White.

Singular Toads.—A correspondent writes: "I was told by a keen observer and an eminent man of science, some time back, that a number of toads examined had *no mouths*. Could you tell me, or find out by means of your Notes, if this fact has been observed, or if it is only apparent? In either case I should like to know what is the explanation."

Exchange.—British shells for living Helicidæ or pupæ of the Macro-Lepidoptera. Address T. Cockerell, 11, Ethelbert Road, Margate, Kent.

To Correspondents.—*J. A. Ollard.* Vol. I. is, unfortunately, out of print. See Notices inside cover.

Communications Received from:—*Miss L.J., A.E.F.F.H., J.S.L., W.Y.F., R.D., F.W.P., J.A.O., H.G.M., A.R., H.W.G., J.F., E.R.S., Miss S., C.E.K., D.H.D.W., J.R.D., T.D.A.C., G.H.W., S.H., A.P.E., W.H.D., G.E.E., F.H.S., &c.*

NATURAL HISTORY NOTES.

EDITED BY FRANK J. ROWBOTHAM,

(Memb. Geol. Assoc. of Lond.)

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PLANT SYMBOLISM, AS CONNECTED WITH THE EARLY HISTORY OF MANKIND.

BY S. MARSHALL, F.R.Hist.S., &c.

(*Continued from p.* 139.)

The next plant I would mention as sacred to the Hindoos, and belonging to the series of thirty in Miss Marianne North's collection at Kew, is No. 318, the Indian Coral Tree (*Erythrina indica*). The flowers are particularly gorgeous, while both the leaves and the bark have medicinal properties. In ancient times there was no antagonism between the scientist and the priest, because the latter combined both offices in his own person. The people were too busy waging war with nature for bare, dear life on the earth; they had not leisure for aught else than this bitter struggle for existence. Leisure is a product and sign of civilization, and only when life grows easier to the people, so as to give them time for thought and scientific study, and they learn, like the priest, the secrets of nature, do they begin to encroach on the priestly domain of science, and the "division of labour" in thought ends in the two classes separating from each other in hostile mood.

Now the various legends connected with the Indian Coral Tree point to some sacrilegious interference of the people with the priest, or to some division or schism between two races or priestly castes. The *Erythrina* was once a sacred and blessed plant; now it is under a curse, and is never used in Hindoo worship. Whenever this is the case with plants, or emblems of any kind, or that any power or symbol once held sacred is held to be accursed, some political and religious revolution has taken place. The God of

Fire of one race becomes the God of Hell—the devil—of another; Light and Darkness become God and Demon; Ahriman and Ormuzd become Good and Evil.

It has been so in all ages and parts of the world—in Persia, India, and Egypt—down to the days when the early Christians declared the gods of Greece and Rome to be devils; although in this latter instance, by the law of compromise, many of the gods were absorbed under different names into the new form of the conqueror's creed, and their symbols shared the same fate. The *Erythrina*, with its gorgeous flowers, became the common property of the people, and so the plant became accursed; and people went on "running to and fro after knowledge," which became increased (Dan. xii. 4). This plant is the *Kuara Pangara*, of which Bruce says: "The seeds" (which are red beans with a black spot which the natives call caret) "have been used from the earliest ages as a weight for gold; hence the word *caret*."

The Holy Basil, or Tulsi, the *Ocimum sanctum*, 319—"the most holy plant of the mint order"—is grown in pots near every temple and dwelling of devout Hindoos, and is sacred to Vishnu and Krishna, or the Creator and Preserver. Beads made from the root are worn, and it is used also medicinally. There is much to interest one in the symbolism of this plant. One must read the legend of Boccaccio, and the glorious rendering of the "simple tale" and "legend old" by Keats, in his "Isabella, or the Pot of Basil," and then study the symbolism of the plant. Isabella plants the Basil in the huge earthen "garden pot" over the buried head of her murdered lover. This Basil is of the same family as that of the Indian Basil; it grows in quantities round Florence, and is given by lovers as a token to each other of mutual fidelity. It is interesting to find thus the plant symbolism of old Judæa still alive in modern Italy.

The Areca, Piper Betle, Areca Nuts, Areca Catechu. The nut, the size of a hen's egg, is said to produce intoxication when first chewed by beginners. The flowers are contained in a membranous sheath, and the female corollas contain the rudiments of stamens. "The most beautiful palm in India."

Albizzia Sebbek and *Plumeria acutifolia* have each characters accounting for their being held sacred, as also the white thorn-apple (*Datura alba*). This latter is a medicine or a poison, according to the treatment of the plant. It is often smoked by

people in all countries who suffer from asthma. The name is Sanscrit, *Dhustura*, denoting a trumpet. It is a strong narcotic, and has been used with fatal results by Bombay thieves, who administer it to deprive their victims of the powers of resistance. It is known as Stramonium.

The Bamboo (*Bambusa arundinaceæ*), with its thousand uses, its great height—from 70 to 80 feet—its virtues, and its value, in every way, is referred to by numberless poets; it is the tree of shelter, audience, friendship. Trees were ever in ancient days the throne, or shelter of a throne, for kings and potentates. When cities were built, trees must needs die—or give way—and then the king "sat in the gate." There is a wealth of Indian literature and legend connected with the bamboo. "Jungle fires being said to be caused by the stems rubbing together" made the bamboo especially and mysteriously sacred as an emblem of the Fire Powers. Buddha is often described by the poets as sitting under a bamboo, and lost in profound meditation concerning the regeneration of humanity.

As for the Fig-tree—the *Ficus glomerata*, *religiosa*, and *indica* or *bengalensis*—any one who has more than superficially studied our Bible and the symbolism of the fig-tree, and mention of it in our own sacred Book, as well as in those of Eastern lands, must be deeply struck and interested by the emblems of the fig and fig-leaves that meet us everywhere.* The tree is held sacred to Vishnu. He, being the creator of the Hindoos, was said to have been born among its branches. "The name *Ficus* is said to come from the Hebrew, to overspread, overshadow, or cover, in allusion to the grateful shade;" one tree is said to have been capable of affording shade from a vertical sun to 20,000 men. Under the fig-tree, or the common banyan of India, Buddha meditated and performed miracles.

Milton distinguishes the fig-tree that produces the fruit, the *Ficus glomerata*, from the *Ficus indica;* and evidently the former "is the tree he had in view for clothing our first parents, though the leaves are not so broad as 'Amazonian Targe;' but allowance must be made for his source of information" (*Graham*). See Pliny, Book 16, chap. xxvi., and Milton's "Paradise Lost," Book 9. See, also, the poetical description of this tree in Southey's "Curse of Kehama," Book 13. The form of the fruit of the *Ficus*

* "North Collection," 325, 329, 339.

glomerata it was, and the mystical *shape* of its leaves, not their breadth, that made it from earliest times a symbol or fruit-word to signify life from death, and constant re-creation; and sacred, therefore, to Vishnu. All three kinds were symbols in ancient temples. The *Bo*, or Peepul (*F. religiosa*), is held particularly sacred in India. Its leaves and those of the banyan are, however, totally different in form from that of the *F. glomerata*, which in many respects has symbol-form in common with the ivy and vine-leaf.

Ives, in his "Voyage from England to India" (1755, p. 46), says of the *Ficus bengalensis*: "There is a certain solemnity accompanying these trees; nor do I remember I was ever under cover of any of them but that my mind was at the same time impressed by a reverential awe."

The imagination of man, his sense of fear in gloom and darkness, and his constant search in all forms of nature for "a sign"—a message from the Powers above him, terrible and mostly destructive to early man—led to the numerous symbolisms of the whole tribe of fig-trees in particular; and "the fig-leaf is still used as a symbol of the Triad." In Oriental countries as much is well known of the symbolism of the fig-tree as of its commercial value. In the ancient Egyptian ceremonies in honour of Osiris, fig-trees were carried in procession, and the Romans used fig-tree wood for sacred and mystical statues. The fig-tree was also sacred to Bacchus. Finally our Bible, and also the Apocrypha, abound in both religious, poetical, and symbolical allusions to the fig-tree, as above mentioned.

The next in the catalogue is the Neem, or *Azadirachta indica*, which has *five* conspicuous petals. According to the poets, the tree is in some cases the symbol of all that is bitter, and the emblem of the evil or dark powers, although it is "a very beautiful tree."

The Mango (*Mangifera indica*) is a symbol of love, and is used by the Hindoos in burning their dead; and Rama, or the Cupid of India, is represented by the poets as tipping his arrows with the tiny flowers.

The Deodar, or Indian Cedar (328), is too well known to need any comment upon it. The poets, attracted by its beautiful towering, spire-like form, and deep colour, mention it repeatedly. The fir-cone has from remotest antiquity been sacred, a double emblem of life and death. It was one of the symbols peculiar to many of the

Gnostic sects, and was in the first centuries of our era employed for Christian monuments. "In all Cyprian coins—where we should expect to see a statue of Venus—we see a cone." Cones carried by the priests figure on the most ancient temples and monuments in the world. See the cones borne by the priests of Nineveh.

The Mahwah (*Bassia latifolia*) (320). A spirit is distilled from this timber-tree, and "it is interesting on account of its being one of the few plants whose flowers are eaten by the human race." The spirit it yields is very intoxicating, and the flowers, which appear in February, have a very heavy, sickening smell. A concrete oil which is obtained from the seeds is used to adulterate *ghee*, and also for frying cakes. The Butter-tree of Africa, noticed by Park and Bruce, belongs to this genus.

The grass used for strewing the floor of temples, *Eragrostris cynosuroides*, was of course forbidden to be used by the people in their houses.

The *Emblica officinalis* was once the exclusive property of the priests, who kept its medicinal virtues secret. It was sacred also as a symbol, because of the flowers possessing a six-parted calyx; three stamens, combined; three dichotomous styles; a fleshy fruit, tricoccous and six-seeded; these being all the sacred or double number of Three.

The Dhak, or Bastard Teak, being one of the loveliest and "most striking of the Indian arboreous Leguminosæ," was of course in most ancient times used in decorating the temples. "It is also called Palasi, and is a venerable and holy tree, giving its name to the celebrated plain of Plassey, in Bengal."

The Sandal-wood (334) was, of course, held sacred for a long period. Sacred vessels could be made of it, the temples perfumed with it, poets sang of it, and its medicinal virtues were utilized by the priests of the Egyptian and Indian temples. Is it not the almug tree of the Bible? "Hiram . . . brought in from Ophir great plenty of almug trees . . . and the king made of the almug trees pillars for the house of the Lord, and for the king's house, harps also and psalteries for singers: there came no such almug trees, nor were seen unto this day" (1 Kings x., 11, 12). "The wood is burnt to perfume temples and dwelling-houses both in China and India. Reduced to powder, it enters into a composition for marking the forehead." "The sandal wood from

golden censers o'er the banquet room diffuse their dying sweets" (Thalaba, Book 6). The "sandal streak" is also referred to by the same poet, Southey, in "The Curse of Kehama," Book 13.

The Asoka (*Saraca indica*), or *Jonesia Asoca*, would, if but for its exquisite beauty both of leaf and flower, have been consecrated to temple decoration, and was so, accordingly, from remotest ages.

The famous Soma-lata (*Sarcæstemma aphylla*) is the theme of prose and poet writers, and a thousand beautiful symbols are concealed or revealed in this renowned plant. It has the mystic five white petals. It yields a milky juice, symbolizing the motherhood of nature; and this juice is used in Brahminical sacrifices. This plant, as well as the next in the catalogue, belongs to the tribe Asclepiæ, a name derived from Æsculapius, the god of medicine. Nearly every plant belonging to the tribe has marked medicinal properties; some are highly poisonous: others are poisonous only at one period of their growth. On the authority of Dr. Gibson, bundles of twigs of the Soma-lata are said to be soaked in the water of the wells from which the fields are watered, tied together with a bag of salt closely pressed to dissolve slowly, and that the water thus impregnated is fatal to the white ants, but does not injure the crops. In ancient times "Soma, or intoxication, was considered to be a Deity," and to spend money on strong drink, if desired by the soul, was ordained as well as permitted (see Deut. xiv. 26). See Rawlinson on the Soma Drink or Soma Worship, or the Adoption of Drunkenness in Religious Rites:—". . . It is probable that Zoroaster left Brahminism because he could not endure the grossly sensual idea which Soma worship involved." The whole literature concerning the Brahminical rites gives endless instruction concerning the stupifying properties of incense of various kinds and the drink and drink-offerings of the Soma.

There remain but two plants of the North collection to be noticed, viz., 338 and 340, the Banyan, or fig-tree, having been previously mentioned.

The *Mimusops Elengi* has astringent or preservative properties, and the fruit is edible; *therefore*, of course, it is one of the symbols of Krishna, the Preserver. It is called in Goa "Adam's Apple." The sacred *Acacia Catechu* yields also an astringent or preservative substance, and the *Terminalia citrina*, which concludes the list of the thirty plants sacred to the Hindoos of the North collection, has, in common with all sacred and symbolic plants, qualities which

account for its being held sacred or dedicated to either Vishnu, Krishna, or Shiva, Creator, Preserver, or Destroyer, *i.e.*, Transformer; and the whole tribe of the Terminalia yielding valuable gums, resins, and acids, and possessing medicinal properties, entitles it to a place of honour among the symbolical or sacred plants. Those which produced tannins and odoriferous resins and gums were used by the Egyptian embalmers, and thus had an additional sacredness as devoted to funeral purposes to preserve the body from decay; and so, as in the case with so many symbols, being at once a defiance thrown to death, and symbol of hope in new creation and new birth and resurrection.

This applies equally to all the plants spoken of in connection with rites and ceremonies of the Jews. Every one can be classified under one or more of the five sections into which the subject is roughly divided in this article (see page 134). A great many survive unnoticed by us at our religious and social festivals all over the world, at birth, christenings, wedding and Christmas festivities; are used as symbols at trials in the felon's dock, as signs of trades and guilds, and finally are always to be found at our funeral rites.

I shall conclude this article with a few pages on some interesting superstitions and plant symbolisms connected with certain festivities at Christmas, when we may eat our Christmas-pudding, and those who marry at that season may cut the wedding-cake with additional merriment if they see that both are crammed and stuffed from the very bottom to the sugared top, or set ablaze with spirit and richly filled with a thousand symbols of love, life, and resurrection.

(*To be continued.*)

NOTES ON THE GLOW-WORM AND ITS ALLIES.

Seventy-two years ago Macartney* published certain observations on the glow-worm, and the conclusion he came to was that its luminosity was a "quality of matter." Beyond this we do not seem to have advanced very far, although more quasi-learned explanations have been offered, such as slow combustion of some form of phosphorus combining with the oxygen supplied by respiration, the imbibition of light separated from the food (or air),

* "Phil. Trans.," vol. x., p. 258 *et seq.*

and then secreted in a sensible form; or it is a phosphorescence, the product of a chemico-physiological process in the living body.*

In *Scolopendra electrica*, and some other animals, the luminosity is due to a fluid matter, which may be communicated to extraneous bodies; in the glow-worm the luminous substance does not differ, except in colour, from the ordinary interstitial substance of the rest of the body, and, according to Carradori, the part will shine for several hours after being cut off from the living animal. In the temperature of the luminous part there is no—or at most only a very slight—difference, nor does the luminosity cause any diminution in its bulk, and it is not increased by immersion of the part in oxygen gas.†

In many species of the glow-worm family (Lampyridæ) both sexes are luminous and winged; in our own familiar species the male has a feeble light (in the warmer summer of the Continent brighter than with us), and even the eggs and larvæ have a certain amount of luminosity.

The glow-worm's light is generally supposed to be for attracting the males. But as males of other species of the genus are luminous, and other members of the family require no light, the necessity is not obvious, and the property so far seems a useless one.‡ Kirby and Spence thought it might be a means of defence.

There is some difference of opinion as to the glow-worm's power of *suddenly* extinguishing her light; generally it is only done gradually. In Luciola, Aspisoma and others, the light is intermittent, flashing at intervals and succeeded by complete darkness. In the Italian fire-fly (*Luciola Italica*) "swarming myriads" may be seen, especially in damp meadows, pulsating—so to say—every two or three seconds. In Malacca, Mr. Cameron, and in Brazil the Rev. H. Clark have observed a simultaneous

* Phosphorescence is also formed in certain lichens and mosses in numerous Hydrozoa, Tunicata (*Pyrosoma*, &c.), and Fishes. In our latitude the luminosity of the sea is principally caused by the Infusorian (?) Noctiluca. Every one knows that some woods, in a state of decay, are luminous.

† Mr. Meldola has examined the spectrum of the glow-worm, and finds it "continuous, being rich in blue and green rays, and comparatively poor in red and yellow" ("Ent. Trans.," 1880, p. iii.). This negatives any idea of phosphorus.

‡ Useless parts are sometimes the survivals of once useful organs, *e.g.*, the small bone isolated in the tissue, and occupying the position of the hind-leg in whales and other Cetacea, whose ancestors were once four-footed. But phosphorescence cannot be a survival.

flashing by numerous individuals, as if they were acting in concert.* Mr. Clark's statement has been confirmed by Mr. Fry, who has noticed them keeping time with each other "as if in obedience to the *bâton* of a leader." These fire-flies belong to the genus Aspisoma.

FRANCIS P. PASCOE.

HINTS ON COMMENCING THE STUDY OF BOTANY.

BY PROF. BOULGER, F.L.S., F.G.S., F.R.G.S.

(*Continued from p.* 144.)

Turner was born probably between 1510 and 1515. His first work was entitled "Libellus de re Herbaria Novus," and has been reproduced in *fac-simile*, and edited by Mr. Jackson (1877); his second, "The Names of Herbes in Greke, Latin, Englishe, Duche, and Frenche" (1548), has been edited for the Dialect Society (1882, Trübner, 8s. 6d.) by Mr. Britten; and his "Herbal" was completed in 1568, the year of his death. Remacle Fusch, born at Limbourg about 1500, died at Liége in 1587, his various works being mainly on *materia medica*. To him was dedicated the popular genus Fuchsia. Rembert Dodoens was born at Mechlin in 1517, and died at Leyden in 1585. In 1554 he published his "Cruydeboeck," which was translated into French by Clusius in 1557, into English by Henry Lyte in 1578, and into Latin, as the "Stirpium Historiæ Pemptades," by the author in 1583. In this work there is some attempt at classification. Conrad Gesner, born at Zurich in 1516, published a work, "De Raris et Admirandis Herbis," in 1555, but his great work, with figures of 1,500 species, was not published when, in 1565, he died, and his ideas on classification were carried out by Andreas Cæsalpinus, called by Linnæus "Primus Verus Systematicus." In his "De Plantis," published at Florence in 1583, he distributes 1,250 plants into fifteen classes, his primary division being into trees and herbs, and the secondary

* Mr. Bates, in the Amazon Valley, has never observed it, nor have I, although I have known them suddenly to extinguish their light when disturbed. One of the North American fire-flies, belonging to the genus Ellychnia, has, I am informed by Dr. Horn, a darting flight, flashing every half-minute. The luminous matter shines when pressed out, and was sometimes daubed on their shirt-fronts by boys, "in lieu of diamonds." Species of Pyrophorus (a genus of the Elateridæ) shine during the day if taken into a dark room. With them the luminous organs are situated one on each side of the thorax. Sir Sydney Saunders has also noticed the simultaneous flashing of the Italian fire-fly.

ones according to the position of the embryo and the nature of the fruit and seeds. Before this, however, in 1561, Valerius Cordus had published at Strasburg Gesner's "Historia de Plantis."

Matthias de l'Obel, born at Lille in 1538, died at Highgate in 1616. After him is named the familiar Lobelia. In 1570, in conjunction with Peter Pena, he published in London his "Stirpium Adversaria Nova," and in 1576, at Antwerp, his "Observationes." His works were largely followed by John Gerard (born 1545), who, in 1596 and 1599, published catalogues of the plants growing in his garden, and in 1597 his "Herball." The catalogues have been edited by Mr. Jackson (London, 1876). In the "Herball" Gerard seems largely indebted to Dodoens, and to have little original merit, but his work long retained its popularity. It contains about 2,000 plants. In 1601 appeared the "Rariorum Plantarum Historia," the chief work of Charles de l'Escluse, commonly known as Clusius (born 1526, died 1609), and in 1606 and 1616 the "Ecphrasis" of Columna, the only writer of his time who seems to have appreciated the views on classification of Cæsalpinus, was published. Caspar Bauhin, in his "Pinax," in 1623, and his elder brother John, in the "Historia Plantarum Universalis" (1650), which describes 5,000 species, both follow the system of l'Obel. The latter work has been well described as "a repository of all that was valuable in the ancients, in his immediate predecessors, and in the discoveries of his own time, executed with that accuracy and critical judgment which can only be exhibited by superior talents." In 1623 Thomas Johnson, who was killed at the siege of Basing House in 1644, published his "emended" edition of Gerard's "Herball," showing far more judgment than the original author. A botanist of perhaps still higher calibre was John Parkinson, apothecary of London, and the King's herbalist (born in 1567), who, in 1629, published a horticultural work, "Paradisi in sole Paradisus Terrestris," and in 1640 his "Theatrum Botanicum." The "Phytologia Britannica" of Dr. William How, published in 1650, which was "the first attempt at a Flora of England," and the "Pinax" of Dr. Christopher Merrett, published in 1666, were both far surpassed by the "Catalogus Plantarum Angliæ" of John Ray, which appeared in 1670, opening a new era in the history of British botany, as did its author's other works in wider branches of science.

Method was now introduced into the enumeration of species. The "Historia Plantarum Universalis" of Robert Morison, pub-

lished in 1678, Ray's "Methodus Plantarum," in 1682, Rivinus's "Introductio Generalis in Rem Herbariam," in 1690, and Tournefort's "Elémens de Botanique," in 1694, form a series of great philosophical works.

Robert Morison, a native of Aberdeen, Regius Professor at Oxford, in his History, and in a previous work on the Umbelliferæ, followed Cæsalpinus in looking to the fruit for his main characters; but so far as influence is concerned, Ray is the founder of a natural system of classification in England. His primary division was into Flowering and Flowerless plants. The former he separated into Dicotyledones and Monocotyledones, and he recognised the natural groups Fungi, Musci, Filices, Compositæ, Umbelliferæ, Labiatæ, Borragineæ, and Cruciferæ. In his "Historia Plantarum," completed in 1704, he described 6,000 plants, and in the second edition of the "Methodus" (1703) he classifies about 18,000 then known. His "Synopsis Methodica Stirpium Britannicarum," published first in 1690, was the first *systematic* Flora of Great Britain. As A. L. de Jussieu said of him, he showed that the true principles of classification must be derived not only from the flowers or fruit, but from leaves, stems, roots, colour, odour, taste, and all the external characters of a plant.

Rivinus first insisted on the classificatory importance of the flower, especially eulogising Cæsalpinus and Ray. Tournefort first defined genera as now accepted, describing 698, including 10,146 species; but in his classification he kept Theophrastus' old division into trees and herbs, basing his subdivisions entirely on the corolla. He distinguished the Compositæ, Scrophulariaceæ, Labiatæ, Rosaceæ, Cruciferæ, Umbelliferæ, Caryophyllaceæ, Liliaceæ, Amentiferæ, Ferns, and Fungi; and his system prevailed on the Continent till the time of Linnæus, as did the superior method of Ray in England.

(*To be continued.*)

BLUE FLOWERS AND BEES.

Mr. Grant Allen is the "Evolutionist at large"—very much at large in the opinion of some—who writes for "ordinary people," who cannot be expected to interest themselves in "the *flexor longus pollicis* or the *hippocampus major*, about whose very existence they are ignorant, and whose names suggest to them nothing but unpleasant ideas."* Ordinary people want, in fact, what they can

* "The Evolutionist at Large," 1881, Preface.

easily understand, so they must be written down to, and with ordinary people there is nothing like being positive in science as in everything else. It carries conviction at once. It is, for example, very pleasant to know exactly how flowers have acquired their colours, as the article in the last number of the NOTES has so approvingly revealed to its readers.

Now, we are told the colours of flowers are due to insects. Flowers were originally yellow because stamens are generally yellow, and the petals of flowers are modifications of stamens. Darwin, Müller, Lubbock, and others, consider that they were in their origin green and inconspicuous. Never mind. Bees and butterflies are the "aristocrats of the arthropodous world," and to allure them certain flowers have discarded their vulgar yellows and whites—good enough for the "riff-raff"—and put on blue and purple. "The fact is," Mr. Grant Allen says,* "blue flowers are, as a rule, specialized for fertilization by bees, and bees therefore prefer this colour; while conversely the flowers have at the same time become blue because that was the colour which the bees prefer." Some flowers also, he tells us, have "acquired perfume as an extra attraction."

In Sir John Lubbock's experiments on the influence of colour on bees,† blue was the favourite of any one colour, but his tables do not show any *very* marked preference for one more than for other colours. For instance, on the first day the bee went five times to the blue in eleven "journeys," six times it preferred other colours (green twice, yellow twice, red once, and white once). Müller's table, quoted by Sir John, "seems to indicate that bees preferred red, white, and yellow to blue." But then, he explains, "taste, quality, or accessibility of the honey" may have exercised a greater influence than the colour of the flowers.

Before we yield ourselves to Mr. Grant Allen's teaching, it would be as well to learn something more of bees other than the honey-bee. We have more than 250 species in this country. Exotic bees are very numerous, and in the tropics they live under somewhat different conditions than with us. "Our knowledge of the subject" (the relation of insects to flowers) "is as yet in its infancy." ‡

FRANCIS P. PASCOE.

* "Cornhill Mag.," Jan., 1882.
† "Journal of the Linnean Society," xvi., pp. 112-13.
‡ Lubbock, "Brit. Wild Flowers," &c., p. 178 (Nature Series).

METROPOLITAN SCIENTIFIC ASSOCIATION.

ORDINARY MEETING.

Tuesday, 10th October, 1882.

H. T. Vivian, Esq., F.R.A.S., President, in the Chair.

The sixteenth annual report of the Aeronautical Society of Great Britain for last year was laid on the table, and the thanks of the members returned to the donor, Mr. F. W. Brearey.

Certificates for the election of Mr. E. G. Moberley, Yokohama, as associate, and of Mr. Edmund Houghton, Walthamstow, as member, were read, and the ballot announced to take place on 14th November.

The following objects were exhibited at the meeting:—

Mr. W. West, L.D.S.—Spectroscope and spectra of Didymium, Chlorophyll, Chromium, Litmus, Turmeric, &c.; also spectra of several incandescent metals.

Mr. Izod.—Numerous Lunar, Stellar, and Spectroscopic Charts.

Mr. J. D. Hardy.—Improved Planisphere.

COMETS.

By H. T. Vivian, Esq., F.R.A.S.

I have chosen "Comets" as the subject of my address this evening because it is a portion of Astronomy, which at the present time is of peculiar interest to astronomers, and also, even to the general public. Last year, as you know, we had in these latitudes no less than three comets, visible at one time to the naked eye, one very feeble, it is true, but as no such thing has happened since the year 1618, it could not fail to excite an unusual amount of interest. Discoveries are rapidly being made, and the attention, not only of astronomers, but of scientific men generally, is being directed towards the unravelling of the secrets connected with these mysterious bodies.

The facts respecting comets may be divided into two classes, the one purely astronomical, and relating to their motions and their paths among the bodies of the solar system; the other physical,

and relating to their structure and the part they play in the system of nature.

Comets appear to move, as do the sun, and moon, and the stars, from east to west, by the effect of the diurnal motion of the earth, but like the planets, they have a movement among the stars, and successively approach and recede from the various fixed stars that may be near their course, and, like their rising and setting, is due to the movement of the earth, but in this case, to its revolution about the sun.

The first, namely, that due to the diurnal motion, is wholly apparent, and a portion of the latter is also due to that motion of the earth by which it is carried round the sun ; therefore, before we can discover what portion is due to the actual motion of the comet, it will clearly be necessary to dissociate from it that portion which is the effect of the motion of the earth ; for this purpose we must find from day to day the position of the comet, and endeavour to discover its distance, upon which, of course, its apparent motion will depend.

The position of any point projected on the celestial sphere, like the position of a point on the terrestrial sphere, is determined by its distance from the equator, and the point on the equator to which it corresponds. The distance from the equator is its *Declination,* and its distance on the equator, from the vernal equinox, in the order of the signs, is its *Right Ascension.* What, therefore, on the terrestrial sphere is latitude and longitude, is on the celestial sphere declination and right ascension, and parallels of latitude in the one correspond to parallels of declination in the other ; the declination is reckoned in degrees, and the right ascension in hours at the rate of 24 hours for 360°.

Before, however, we can make use of what are called the co-ordinates thus obtained, we must transform them into other co-ordinates referred to the ecliptic ; in fact, they must be referred to the circle in which the earth performs its revolution round the sun. Since the ecliptic cuts the equator at the vernal equinoctial point, and the magnitude of the angle where they meet is known, this is easily performed. The distance from the ecliptic will then take the place of the distance from the equator, and a point of the ecliptic corresponds to the point on the equator. The new co-ordinates are called the *Latitude* and *Longitude,* and the position of our comet being referred to the

ecliptic, can be compared with that of the sun, and can even be transformed into a position as seen from the sun itself provided we knew the distance. Therefore it will be seen that if we could by any means discover its distance from day to day, we should not only know its rate of motion, that of the earth being of course known, but we should be able to discover its whereabouts as seen from the sun. Let us see how far we are able to arrive at a solution of the problem. We know the distance from the earth to the sun, or the earth's *radius vector;* we also know the longitude of the sun, taken from an ephemeris; and we have also found the longitude of the comet; therefore we know the magnitude of the angle at the earth, between the sun and the point in the ecliptic, which corresponds to the comet,—in fact, we have a triangle formed by the lines joining the sun, the earth, and the place of the comet in the ecliptic, of which we know the value of one side and an angle; quantities, however, insufficient to enable us to resolve the triangle unless we know another side or angle; observation will give us nothing more. We are therefore obliged to make a supposition, or a hypothesis, and to assume a value for another side, *i.e.*, the distance projected on the ecliptic of the comet from the earth. According to this supposition, we reduce the triangle, and we have the distance from the sun and the angle at the sun between the earth and the comet, from which we deduce its longitude as seen from the sun, or its heliocentric longitude. The same process for two other observations will give us three heliocentric longitudes, and having also three distances from the sun, we are enabled to obtain three heliocentric latitudes; in fact, three points in the curve described about the sun, based upon our hypothesis.

Now it has been shown by Newton that a body may revolve about the sun in either of the curves known as the Conic sections, and he has also pointed out that the rate of motion may be found provided we know the distance from the sun. The parabola is the curve generally chosen for a first trial, and having three points in the curve, the rate of motion is calculated. If the time found by calculation agrees with the intervals between our observations, our hypothesis is correct, and three points in the orbit have been found.

If this is not the case, another supposition must be made, and their positions approximated to, by the rule of false position,*

* Better methods are now in existence, but of these it is not easy to give an idea; the same principle is intended in all of them.

until we arrive at perfect agreement. Having in this manner found three heliocentric positions, the parabola may be described, and the shortest distance from the sun (expressed in parts of the mean distance of the earth at its perihelion distance) may be found, as may also the time of the passage of the comet through the perihelion.

We have now found the dimensions of our orbit; its position in the heavens remains to be determined; evidently the plane of the parabola must pass through the sun; consequently it will meet the ecliptic in a straight line, of which one part is known, viz., the centre of the sun. Another point is necessary, and the point chosen is that in which the orbit meets the plane of the ecliptic, and through which the comet passes in going from the south to the north of that plane, or the *Ascending node*. This element, however, does not determine the angle the plane of the orbit forms with the ecliptic, which is necessary to be known, because an infinite number of planes may meet in one line. Another element called the *Inclination* is therefore necessary.

(*To be continued.*)

OUR "LOOK-OUT" COLUMN.

Lichens.—On old walls, on Alpine rocks, on bark, or hanging from the boughs on bare limestone or on sandy heaths, lichens can be found almost everywhere. Smoke is, however, fatal to many of them, and the Londoner will find but few in Kew Gardens or in Epping Forest. Leighton's "Lichen-flora of England," Lauder-Lindsay's "Popular History of British Lichens" (Lovell Reeve), and the Rev. J. Crombie's article "Lichens," in the "Encyclopædia Britannica," form a library for the beginner. There is no difficulty in collecting, and when collected lichens have only to be kept dry. They derive their nourishment from the air, and occur in dry situations as well as in moist, living for untold ages and growing but slowly, thus differing alike from Algæ and from Fungi. In their first stages, however, many lichens appear as minute green Algæ, and they subsequently retain a layer of green cells, known as "gonidia," imbedded amidst the fungus-like threads or "hyphæ," which give them their usually grey colour. Orange, black, red, and other colours also occur. The saucer-like fructification differs but

little from that of the Ascomycetous Fungi, such as Ergot or the Fairies'-bath (*Peziza*). It has been suggested that lichens are not distinct plants, but Algæ and Fungi living together in a state not of parasitism so much as "commensalism." On firs and other forest trees hangs the shaggy grey fleece of the common *Usnea barbata*, or in sub-Alpine woods the more hair-like *Cornicularia jubata*, sometimes two feet in length. Yet more common is the broader, bifurcating grey frond with its brownish fruit-cups of *Ramalina fraxinea* on the ash and oak in hedges or in forests. On sea-cliffs occurs the browner, tough *Ramalina scopulorum*, sometimes nearly a foot in length. On palings may generally be found *Physcia prunastri*, with a frond greenish above, white beneath, about $\frac{1}{8}$in. broad, and with many points. The Alpine *Cetraria islandica* is commonly sold as "Iceland Moss." Among moist moss is commonly found the broad, dark green fronds of *Peltigera canina* with marginal "apothecia." This species, often over an inch in breadth, turns brown or grey when dried. It is among the Highland mountains or the older rocks of Wales, Malvern, and Cornwall that many types must be looked for. I have the handsome *Sticta Pulmonaria*, or "Lungs of Oak," with large olive-green fronds, almost like those of the Elk's-horn fern, but hollowed out on the surface and scattered over with brown "apothecia," from Devonshire. On old ash trees or on walls we find the flat round-crenulated patches of *Parmelia pulverulenta*, or *P. saxatilis*, which are grey, whilst on palings as well are the lovely orange discs of *P. parietina*. Encrusting limestone rocks with a grey, black-dotted covering, *Urceolaria calcarea* is not uncommon. Mountains are slowly worn away into vegetable mould by the members of the flat genus *Lecidea*, which are brick-red, blackish green, grey, yellow, smoke-coloured, white, verdigris, or rusty in hue. Marking the smooth bark of many trees with letter-like markings are the *Graphideæ*. On dry banks and heaths the pretty "cup-mosses" are common, *Cladonia extensa*, with bright scarlet tubercles on the edges of its little grey cups; *C. pyxidata*, the common grey form; the "Reindeer Moss," *C. rangiferina*, "the wiry moss that whitens all the hill;" and others. On the oak, ash and beech are grey patches marked with concentric lines with "apothecia" in the middle, the thallus of *Pertusaria communis*; or the small, black, globular warts of the *Verrucarias*, which also occur on rocks. The determination of many species is involved in

difficulty; they are protean in character, often not fructifying, and microscopic in size. Still, as Mr. Ruskin has pointed out, their vast effects on landscape and on geology in forming the many-coloured nidus for the first accumulation of soil on the barren mountain-side render them of interest alike to the artist and the philosopher.

G. S. Boulger.

NOTES AND QUERIES.

A Moorland Ramble.—I went to Gavistoch last month, intent on moorland air and scenery, but the clouds wept almost continuously, only giving us a few lucid intervals, and I came away sorrowful, with unspoiled paper and unused colours. I never saw the moors more beautiful than they were this year (when they were visible), the heather so brilliant and large, and the autumn furze so golden, and both in such profusion. One day, tempted by a fine morning and encouraging assurances of the weather-wise, we went off by train, and resolved to walk back over Roborough Down, which presented a most gorgeous spectacle of purple and gold; but the rain caught us up, and we had to squat under a great furze bush, like a couple of old hens under a hedge, till the sky cleared a little; and just at my feet was the loveliest little fairy garden you ever beheld, little sprays of purple heath, a few small golden potentillas, eyebright, and a tuft or two of thyme, peeping through the delicate grass. And I said to myself, Why are these things so beautiful and so perfect, whilst all that we poor mortals attempt is done in such a bungling, imperfect way? Is imperfection and bungling a sign of a higher perfection yet to be attained? G. H. W.

St. Mary Church, Devon, 18 Sept., 1882.

Notes on Sundews.—18th Aug., 1881: Fed a leaf with a small insect that was crawling about, killing it first. Fed another leaf with the abdomen of a freshly killed fly. Another with head and thorax of same, with wings attached. A fourth with abdomen of *dead* fly. A fifth with the head of same. A sixth with wing of same.—19th: The leaves which I fed with portions of fly yesterday (about 24 hours ago) have spread their tentacles over the food. Some portions seem to be nearly digested—the tips of the tentacles

being almost black by absorption—probably aided by the rain which fell during the night, the plants being exposed. The wing of the *stale* fly, however, remains about the same, except that the tentacles have partially closed over it. Have killed and placed a small fly on the tips of the expanded tentacles of one half of a leaf, the other half being engaged in digesting the abdomen of fly with which I fed it yesterday.—20th (noon): Digestion going on slowly. The wing of the stale fly seems, however, to be untouched, the tentacles having again expanded, leaving the wing loose in the centre. The small fly which I placed yesterday on the side tentacles of a leaf has now been carried to the centre of that leaf.—28th: Some crumbs of bread with which I fed the leaves yesterday morning have been almost entirely absorbed, the remains being turned *pink* (a proof that the tentacles contain an *acrid* property ?).

X.Y.Z.

Do Spiders Kill Toads ?—

> His pouting cheeks puff up above his brow,
> Like a swollen toad touch't with the spider's blow.
>
> J. Hall, 1602.

Dr. Lauder Lindsay, in his "Mind in the Lower Animals" (Vol. ii., p. 384), quotes from "Science Gossip" an account of a toad bit or stung by a spider resorting to the leaf of the *Plantago major* as a remedy; when this was removed the toad died after repeated bites of the spider. I value my great, fat, beautiful spotted toad too highly to experiment upon him, and I can hardly credit the spider with so much power for mischief.

G. H. W.

St. Mary Church, Devon.

Land and Freshwater Mollusca.—I have found the following land and freshwater mollusca at Chislehurst and neighbourhood:—*Cyclas cornea* and *C. lacustris*, common in ponds. *Bithinia tentaculata* and *Vulvata piscinalis*, common at St. Mary Cray. *Planorbis albus*, a few specimens in a pond. *P. vortex*, St. Mary Cray. *P. complanatus* and *P. contortus*, not uncommon. *Physa hypnorum*, several specimens in a ditch, where I also found *Limnæa truncatula*. *Limnæa peregra*, streams; var. *ovata* is very common in ponds. *L. stagnalis*, in ponds. *Ancylus lacustris*, ponds. *Arion ater*, very abundant; varies in colour from black to light yellowish. *Limax maximus*, common under logs, &c. *Succinea*

elegans and *S. putris*, ditches. *Vitrina pellucida*, on grassy banks. *Zonites cellarius* and *Z. nitidulus*, common. *Z. crystallinus*, on banks. *Helix aspersa*, common. *H. nemoralis*, common amongst ivy. *H. hortensis*, very abundant amongst ivy, &c.; the shell of this mollusc varies very much in colour and shape; I have found yellow, red, violet, brown, and white specimens, with or without stripes. *H. cantiana*, abundant. *H. rufescens* and var. *concinna*, common on banks. *H. virgata*, St. Mary Cray. *H. caperata*, common amongst grass and on walls; var. *ornata* is frequently found with it. *H. ericetorum*, on palings. *H. pulchella*, var. *costata*, amongst grass. *Bulimus obscurus*, common. *Pupa marginata*, on trees, &c. *Clausilia perversa*, banks. *Zua (Cochlicopa) lubrica*, very abundant. The white varieties of *Helix ericetorum*, *Pupa marginata*, &c., are not uncommon.

Sept. 5. T. D. A. C.

Three-leaved Myrtle.—Some years ago I possessed a fine plant of this variety of myrtle where *three* leaves spring from a single node, instead of two, as in the ordinary myrtle. An old Jew (a dealer in old clothes) noticed it when passing, and begged of me to sell it to him, because, he explained, the three-leaved myrtles were used (in what way I do not know) in their synagogue worship. I refused to part with the plant; but a few days later it was gone from the porch where, till then, it had stood. I naturally concluded that my friend the worthy Jew had had something to do with its abstraction; and this conclusion, coupled with his anxiety to possess it even by offers of purchase, makes me desirous of learning whether there is any (and, if so, what) symbolism attaching to this particular variety of the myrtle in the Jewish ceremonies. Perhaps the author of "Plant Symbolism" will kindly inform me.

E. A. R.

Communications Received from—*W. J. S.*, *A. A.*, *J. W. R.*, *T. D. A. C.*, *S. H.*, *R. M.*, *J. S. MacD.*, *H. C. L.*, *H. G. M.*, *Miss M. J.*, *F. P. P.*, *E. S.*, J. M., R. C., A. M. W.

Erratum.—Page 145, line 14 from top, for "*A. satyrus*" read "a *Satyrus*."

NATURAL HISTORY NOTES.

EDITED BY FRANK J. ROWBOTHAM,

(Memb. Geol. Assoc. of Lond.)

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PLANT SYMBOLISM, AS CONNECTED WITH THE EARLY HISTORY OF MANKIND.

BY S. MARSHALL, F.R.Hist.S., &c.

(Concluded from p. 159.)

We may inaugurate our Christmas number on plant-lore by telling of the mistletoe. How few of those who have the sweet common-sense to give the Christmas kiss of peace under the mistletoe bough—and certainly none of the old grumps and frumps who frown upon the pretty ceremony—know what a beautiful meaning lies hidden in the custom.

It is the old, old story; a kiss to soothe a quarrel. The mistletoe grows on the oak, and on other trees, bearing strange moon-like, nearly colourless berries, which give it a mysterious appearance. Those old Sun—and Nature—priests, the Druids, of course took it for a symbol of winter. The plant refuses to grow upright, and on the upper side of a branch; but the slimy seeds slide down gradually, and stick to the under side if they fall or are placed on the upper side, an experiment frequently tried. Growing thus, pointing to the earth and not to the sky, it seems natural that it should be sacred to, or a symbol of "Hecate the underworld moon"; it was therefore the symbol of night, winter, and death. It was like the cross-grained old fairy god-mother who doomed the infant to death, when all the other god-mothers had dowered the babe with gifts of life, love, and beauty. The icicle is the old witch of winter's spindle, with which she spins for the warp and woof of our wintry shroud and temporarily kills our earth, our sweet "Sleeping Beauty," who must be awakened by a

kiss from the little Prince of Spring. In the beautiful collection of tales, "Old Deccan Days," we have the sun, or summer-earth, Luxman, the Rajah's loving friend, turned into stone by the bitter, biting cold words of the Rajah, and he must remain in this stony sleep until after "eight long years" the Rajah's baby child shall voluntarily touch the statue. This happens, and the entranced Wuzeer, feeling the baby-touch, stoops down and *kisses* the child.

Note here eight times twelve months—nearly a hundred. In northern legends of the kind, it is also a hundred days or years, typifying our hundred days, or thereabouts, of winter.

Baldur, the Teutonic or Scandinavian hero, is beautiful, and beloved of all the gods, who agree to endow him with immortality; but, as in the case of the story of the Sleeping Beauty, one of the Powers was omitted or forgotten. This *blind* god, Hödr, slays Baldur. "He is simply the power of darkness triumphing over the Lord of Light;" he is winter freezing the earth into a hundred years, days, or periods of sleep. Hödr, or Loke, one of his many names, slays Baldur the beautiful by merely throwing a *twig*, a tiny branch at him. The gods had laughingly hurled rocks, trees, weapons and missiles of all kinds at the hero, who had stood bright and invulnerable before them; but the unappeased Loke or Hödr flung merely a *branch of mistletoe* at Baldur, who fell into the death trance, from which some day he is to awake. There is a legend that the cross on which our Lord was crucified was made of the mistletoe. This is strange, because of the small size of the plant. In Worcestershire, farmers were in the habit of taking a bough of mistletoe and giving it to the cow that first calved after New Year's day. The implacable and irresistible night and cruel winter have only temporary power. We wait for the light, we long for the summer.

Give, young and old, at Christmas-time, therefore, the symbolical kiss of peace under the emblem of death and darkness. The sun and his warm kiss shall awaken the earth; and love, symbolized by the sun and his all-conquering lance or mighty arrow, shall, in the human kiss of peace, again cast a defiance at death, darkness, and winter, and proclaim love, life, birth, and resurrection as stronger than death.

Having begun our Christmas day with the Kiss of Peace, let us eat our Christmas-pudding with intelligence, and those who marry

at this season, let them share the mystical wedding-cake also with more than mere unenlightened gustative pleasure. Thousands of years ago food, fruit, and cakes were *read* as well as eaten, were indeed truly mentally and inwardly digested. Our hot-cross buns are a survival of the most ancient Indian, Babylonian, Ninevite and Egyptian times. They figure on the most ancient monuments and gems, and were absorbed by the early Christians into their symbolism, as well as the peacock and hundreds of other ancient emblems. To this day we have, even in France, dragon-shaped,—and heart-shaped cakes all over Europe; cakes of honey and butter,—huge dome-shaped puddings of these latter are sold at the great festival times in Turkey and all over the East. As the rice thrown after the bride and bridegroom is a wish for their happiness uttered in plant-symbolism, and as the funeral-cakes, the sugar-plums and almond comfits handed round to this day at both wedding and funeral ceremonies in the East and elsewhere, are wishes for life, prosperity, and posterity,—or hopes uttered in plant-words for future life, for resurrection from the sleep of death—so every ingredient in our Christmas-puddings and wedding-cakes is a wish and hope to the same effect.

She would be a learned, but, let us hope, not therefore an uninteresting bride, who could tell us the lovely stories connected with her wedding-cake; nor would the schoolboy eat less of his Christmas-pudding if he knew the symbolism of each of its ingredients. We will name a few of them.

The flour, the basis of all cakes and festival puddings. Corn is the most ancient symbol-word for growth and fertility. It is one of the emblems of Ceres, who is identical with Astarte, Juno, and typical womanhood. The raisins and currants are the fruit of the vine, which also, both in fruit and leaf, is a type of Bacchus, and Cybele the mother goddess. Oriental writings, and indeed sacred books and poems of all ages, abound with references to the plant-language, or symbolism of the vine. As food, as fruit, as inspiring juice,—life-giving, or maddening,—with its three-fold ample leaf, the vine figures not only in books and poems, but in painting and sculpture ancient and modern, and a thousand lovely and mystical meanings are represented by the vine.

As for the spices, one has only to thoughtfully study the numerous (more than thirty) references to the use of spices in our English Bible to see what they symbolise. Delight to the senses,

quickening and reviving powers, and, above all things, preserving properties. So that odorous plants and spices are sacred to, or symbolical of both Vishnu the Creator and Krishna the Preserver; so that spices figure at all festivals, births, marriages, and deaths, and were particularly useful to the embalmers, and plentifully used at the burying of the dead. In ancient poems spices are constantly referred to; while, as I have said, a world of suggestive study of symbolism is to be found in our English Bible under the heading of spices.

The honey used in early times for the cakes, and still used in the East, is in England replaced by sugar; but honey was one of the most sacred emblems. It denotes eloquence, beauty, loveliness, and pleasure. It is the emblem of the goddess Mylitta, *Melitzah* meaning *eloquence,* and a surname of Artemis, the goddess who assisted at the birth of children; "the nymphs who nursed the infant Zeus were called Melissæ, and were often figured as bees," and the Roman Catholic Pontiffs adopted bees as a sacred emblem. The sacred grove or trees figuring on the walls of Nineveh were sacred to this goddess, the phenenan of whose name signifies a helper or refuge, whence also the Greek name Melite, or Malta, is derived, which also signifies a refuge.

The symbolism of the butter and eggs is too well known to need more than a passing reference. Oil and wine, as typical of fertility and peace, likewise need no further comment here. The olive and the holly-berry were of course symbols of feasting and peace, as are nearly all berry-bearing plants, especially if, as in the case of the orange and its substitute the myrtle, the flowers of which figure at the bridal ceremonies of all countries, the flowers or leaves have any peculiarity of form or sacred numbers denoting the Triad or holy Three of Nature—Creator, Preserver, and Destroyer, or Transformer. This is the reason why the myrtle that has three leaves growing from the nodes instead of the ordinary two is still, among the Jews, an especially sacred or *lucky* emblem, and eagerly sought for by those who are childless. (See NATURAL HISTORY NOTES, p. 172). The sharp spines of the holly were the Christian symbol of the Crown of Thorns in northern countries, there being both in Italy and Greece two or three very formidable prickly plants, round which cluster legends concerning the Crucifixion.

The preserved peel used in festival cakes and puddings are all from

symbol plants, the citron, orange, and lemon. There is a whole literature concerning the citron, lemon, orange, apple and pine-cone in our own, and the sacred and poetic books of all countries, sufficient to give ample and fascinating work to the student of the subject of symbolism; and the earliest of the Italian masters knew this, and in their paintings of the Virgin and Child frequently made garlands and borders round their pictures of these most symbolical plants and fruits, which are found constantly associated with the fig, pomegranate, and melon.

The salt inevitably used in festival cakes needs no comment here; its symbolizing virtue, goodness, all that alone can resist corruption and evil, is too well known by the words: "Ye are the salt of the earth." On the bread, minced-meat, suet, &c., we need say nothing here. There are mystical symbolical cakes in all countries, one consisting entirely of sugar and almonds in Sicily, and which is delicious as well as emblematical, is met with in our wedding-cakes, and is the part for an undue share of which we are all tempted to embezzle!

The almond is the most ancient symbol of womanhood, of the fruitful earth, of kind and generous mother Nature; and the blossom, leaf and fruit of the almond tree are a whole poem on plant-symbolism.

Finally there is, at Easter, a cake made expressly for that festival, and which I have partaken of in Sicily and Italy as a martyr to symbolism, for it is made of blood and eggs; and with this I will conclude,—fortunately before our Christmas-pudding is brought in, blazing with typical fire sacred to the Destroyer, or rather Renovator and Transformer.

The study of symbolism enables the thinker to hold hands with his fellow-thinker of all ages and places, religions, and forms of religion, and with the poets of all times and nationalities. He is a humanitarian, and lives in deep sympathy with man in all his past and present struggles to "find out God," to penetrate the mysteries and meanings of life and death, joy and sorrow. He watches the growth of man's reason, civilization, even his language, as so much of it was built out of symbol, every word being at first pure symbol. The grave philosopher can walk gravely with the Druid and with the Christian in procession, with symbol oak or lighted taper, and he can take the pomegranate and cross-stamped cake of Nineveh or of England alike; and he can

take the mystic Bacchic thyrsus in his hand and join in the dance, the measure of life, before the altar of nature with his fellows. To him all is sacred, pathetically sacred, in the study of man and his symbol prayers to the unknown God. Nothing is profane to the thinker : he knows and feels that

The poetry of Earth is never dead.

He watches the strivings of man to understand Nature, and sees her forced to yield up her secrets to his questionings, and lead him gradually out of sadness and savage life into gladness and civilization.

To enter deeply into the subject of symbolism one must not only have the heart of a poet, and a love for nature, but one must be a botanist; and as botany is of all studies, and in all its branches—microscopical, chemical, &c.—easily accessible to women, it is a marvel to me why they neglect it, and turn away with idle horror of the easily mastered nomenclature of the science. How many hard-working philosophers and men of science would find real helpers in their wives, sisters, and daughters if these would but know what a grand bond of delightful union it is for families to have common objects of interest to share with each other; and with the artistic faculties women possess, and their enthusiasm and earnestness when once they are truly awakened, even in follies and trifles, they might not only become scientifically profound, but might search out and reproduce for us in painting and sculpture all the plants and other symbols that were, and still are, the Hieratic language of all nations.

A VISIT TO A CHESHIRE SALT MINE.

By B. B. Woodward, F.G.S., &c., of the British Museum (Natural History).

To go down into Cheshire and return without having seen a salt mine would in a Geologist be unpardonable. Accordingly when, in the autumn of 1881, business took me in that direction, I eagerly sought an opportunity to visit one of the mines for which the county is famous. I had set my mind on exploring the best salt mine of the Northwich district, but I was doomed in this to be dis-

appointed. It was not till the day preceding my departure for home that I found myself with an hour or two to spare, and then of course no means of conveyance to Northwich was to be procured in the out-of-the-way spot where I was. A nearer, if less celebrated spot was however within easy hail. According to the Survey map, Winsford, distant just four miles across country, would furnish the requisite means for gratifying my curiosity concerning the appearance of rock salt *in situ*.

A series of foot-paths led thither in almost a direct line, and though, owing to the wetness of the season, the way was by no means dry, still it was far less monotonous than a high road would have been. As I approached the place, and was beginning to speculate which of the numerous works, whose tall chimneys were fouling the air, I should apply to, a gentleman overtook me who was familiar with the place, and by him I was most obligingly guided to the mouth of the only rock-salt mine in the district (the other works were pumping brine). Here, as good luck would have it, the men were at work, not an every-day occurrence, as the demand for the unrefined rock salt is not very great in this locality.

The surroundings of the pit's mouth were of the queerest kind, for the owner (a German) had sought to relieve the dreary aspect of the smoke-begrimed cottages, schoolhouse, and works, by facing them all with "clinkers," and giving to every building, including the two wooden towers of the windlass, a castellated top; whilst the brine pumped hard by, and conveyed along an open trough, fell in a double cascade over clinker-lipped basins into the reservoir. Beyond was the river, its course marked out by the masts of the barges and by the huge cinder-tips on its further bank. A crowd of tall chimneys marked the position and extent of the town (or, to speak more correctly, cluster of villages) generally known as Winsford, over which hung a dense cloud of smoke. Not a tree grew near, and very little herbage of any sort was to be seen, whilst the air was thick, heavy, and resonant with the clanging of hammers.

Permission was readily granted to descend the pit, and accordingly, as soon as one of the tubs had discharged its cargo of salt, I was requested to step into it; two of the miners followed, and the descent began. As the tub was not more than three feet across, one of the men had to stand on its edge, and hold by the chains

above. Moreover, as there was a circular shield a short distance above the tub to prevent accidents from stray falling masses, and as the draught blew the candle out shortly after we started, the descent was accomplished in profound darkness, which seemed to render the "whirr" of the machinery and the "chiff, chiff" of the tub when it touched the sides of the narrow shaft yet more audible.

"Suppose the rope *were* to break?" was the thought that came naturally into one's mind.

At last voices were heard below, a ring of light appeared round the rim of the tub, and it was seen that the diameter of the shaft but slightly exceeded that of the tub itself. Then as we reached the floor of the mine a slight bump occurred, inducing in me a wish promptly to sit down on the bottom of the tub, but this was as promptly prevented, and I was assisted out by one of the miners.

A candle stuck in a lump of clay was handed to me, and as my eyes grew accustomed to the darkness, I became aware that I was standing in a large sort of central hall whence galleries radiated in all directions. The air was cool and pleasant, but decidedly briny, and brought the seaside vividly to mind. The coolness, however, was not so great but the miners at work were stripped to the waist, for the task of wielding pick and shovel soon makes them warm.

The mine in which I found myself was 480ft. from the surface and the vein ran about 18ft. thick, whilst horizontally it extended several hundred feet in different directions from the shaft.

The main galleries were connected by other galleries till the whole place was honey-combed with huge pillars of salt 36ft. square, left standing every few yards, to support the roof and superincumbent strata.

A smaller vein, less seldom worked, lay some 80ft. above this one, but none had been found at a lower level. A sinking had once been made for 60ft. below the present floor of the mine into a hard, dark brown ferruginous shale, which was so unpromising that further search was abandoned.

The matrix of the salt vein was a hard, greenish grey, splintery shale of Triassic age.

No fossils, so far as I could ascertain, had been obtained from it when the shaft was sunk.

The main mass of the salt vein was very impure, and consisted of flesh-coloured, crystalline salt, with brown earthy matter en-

tangled in it, reminding one strongly by candle-light of Shap-Granite. Perfectly clear and transparent crystals were, however, not infrequently met with, though not so commonly as at Northwich ; whilst very rarely a handsome red fibrous variety is found.

In working the salt, blasting is resorted to, and whilst a blast-hole was being filled for my edification, the foreman, who was piloting me, discoursed on the virtues of coarse-grained gunpowder as a cure for the tooth-ache, and proceeded to crunch some up as though eating sweetmeats, an example which, it need scarcely be added, I did not imitate. When the charge had been fired, it was found that nearly five tons of material were loosened; this was immediately broken up by the workmen, placed in tubs on trucks, and wheeled off to the shaft ready to be hauled to the surface As we wandered round the mine, glimpses were caught now and again of the men at work, or of flitting lights interspersed with profound darkness; the caverns echoed to the sounds of rolling trucks, of shouting and bustle, which seemed now near and now far, according to our position; whilst every few minutes a sound like thunder, resounding to the inmost recesses of the mine, told of the discharge of a fresh blast-hole. The entire scene was so new, so strange, not to say weird, and yet withal in its way picturesque, that I look back with no small pleasure to my first visit underground. This enjoyment of a new experience was, if anything, enhanced by finding in the foreman who accompanied me a man who not only understood his work, but who had also acquired a considerable knowledge of the geological history of salt, its origin and formation.

This aspect of the salt mine cannot, however, be discussed just now, or the editorial scissors would assuredly have to be brought into play, and I will therefore bring my account to a close, merely remarking that an hour's stay in a saline atmosphere is conducive of thirst, and that should any of my readers propose to visit a salt mine in a spot where restaurants are *not*, they will do well to carry some fluid with them to consume on emerging therefrom, especially if they have 9lbs. weight of specimens to carry away with them. Otherwise they may be compelled, as I was, to beg by the wayside, in which case I sincerely trust that they may meet with as kind a reception as I did.

HINTS ON COMMENCING THE STUDY OF BOTANY.

By Prof. Boulger, F.L.S., F.G.S., F.R.G.S.

(Continued from p. 163.*)*

Carl von Linné, born in 1707, died in 1778. The first sketch of his Artificial Sexual System appeared in his "Systema Naturæ," published at Leyden in 1735, and it was further carried out in the "Genera Plantarum" (1737), and the "Species Plantarum" (1753) in which no less than 7,294 species are defined. Linnæus' great services to botany were the establishment of the binomial system of nomenclature and of verbally accurate and terse definitions. He required every species to be definable in twelve words. He adopted Ray's division of the Vegetable Kingdom into Flowering and Flowerless, coining the names Phanerogamia and Cryptogamia ; and then divided Phanerogams into twenty-three classes by the number and character of the stamens. These were mainly subdivided into orders according to the number of carpels. Linnæus himself only regarded this as a tentative system for practical purposes. "The fragments of a natural system," he writes, "must be diligently sought for. This is the first and last aim of botany. Nature does not leap. All plants show relationships in various directions like the countries touching one another on a map. I have myself worked long at the discovery of a natural system, but have not been able to accomplish it." In his "Philosophia Botanica" (1751) he gives the following advice to the student : — "Let the description follow the order of development. Let it represent the parts as briefly as possible, yet perfectly, using, if they are sufficient, technical terms only. The tyro should study species of plants unknown to him according to their classes, their (generic) characters and their (specific) differences. Let him understand fully the fundamental principles of botany. Let him render himself familiar with the history of botanical literature, and especially with authors who have to be consulted as to species. Let him accustom himself to trace the synonyms used by authors, working backwards to the first authority."

(To be continued).

OUR "LOOK-OUT" COLUMN.

The Hepaticæ or Liverworts.—The damp bark of trees, the ground beneath the drip of their boughs, the rocky banks of mountain streams, or the moist pavements of our greenhouses, are the habitat of these allies of the Mosses, many of which are in fruit in December and January. Some account of them is appended to Stark's "History of British Mosses" (Routledge), and a summary of their structure is given in the article "Liverworts," by Dr. Carrington, in the "Encyclopædia Britannica;" but the most accessible account of our British species, is in a threepenny pamphlet, by Dr. M. C. Cooke, published by Mr. Bogue. They are either broad, bifurcating, green, thalloid fronds, as in the three genera *Piccia*, *Anthoceros* and *Marchantia*, or they have a double row of small leaves along a partly-erect stem, as in most species of the genus *Jungermannia*, which thus closely resemble Mosses, the thalloid forms appearing more lichen-like. *Riccia crystallina* grows on banks, varying from bluish to yellowish-green, with a fleshy frond in which the reproductive organs and the fructification are imbedded. In *Anthoceros*, the dark-green frond produces long, erect, tapering "sporogonia," which split down from their points discharging the spores. *Marchantia* has a thick, spreading frond, which we often see on rock-work in aquaria and conservatories, and which when slightly starved send up erect stems, some bearing an eight-lobed disc, in which are sunk the "antheridia;" others, a peltate, eight-lobed, star-like umbrella, from beneath which hang the "sporogonia." The frond has well-marked breathing-pores, or "stomata," and also little cups containing minute buds or "gemmæ." The moss-like *Jungermanniæ* generally produce a long terminal fruit-stalk, ending in a brown capsule that splits into four, discharging spores and spiral threads known as "elaters." About a dozen species can be found within the limits of Middlesex, in such localities as Harrow Weald Common, Pinner Wood or even Hampstead Heath. The ripe "thecæ" should be observed when on the point of bursting under the combined influences of moisture and sunshine, when the elaters may be seen with a lens violently contracting and dilating to expel themselves and the spores, "as if an immense number of minute serpents were writhing in the most dreadful agonies, and combating each other with unmitigable fury till not one was left alive upon the field."

G. S. Boulger.

METROPOLITAN SCIENTIFIC ASSOCIATION.

THE STRUCTURE AND DEVELOPMENT OF TEETH.

By W. West, Esq., L.D.S.

(*Read Tuesday, November 14th*, 1882.)

The first question that arises is, What is a tooth? You will probably say, a masticating organ; an answer applicable to some teeth only; there are others in which the function is of a character totally different; for example, the tusk of the Narwhal or Sword-fish is but an abnormally developed tooth, growing from the upper jaw, and is used solely for purposes of attack and defence. It is developed in the male only, the corresponding tooth in the female being merely rudimentary. The tusks of the Elephant, Walrus, Wild Boar, and some other animals are mainly devoted to purposes of sexual warfare, and are not used as organs for mastication. The Walrus uses his tusks as a lever to assist himself on to the ice, from the water. Some teeth are prehensile organs; especially is this the case with fishes, enabling them to retain their food and to adjust it in the best position for swallowing. Another use will be found in the poisonous fangs of snakes. Some naturalists have sought to classify the Vertebrata according to their dentition, but modern investigation has revealed the fallacy of depending entirely upon these dental organs. If the teeth alone were to be our guide, we ought to place the Sloths, Armadillos, Ant-eaters, &c., amongst the Cetacea (Whales and Porpoises), for their teeth are nearly all alike in shape in both groups, and their mouths also resemble each other in being deficient of front teeth or incisors.

Teeth may be divided into three great classes according to their mode of attachment to the jaws. Firstly, attachment by means of a fibrous membrane. Secondly, by "anchylosis," that is, joined to the jaw-bone, no membrane being interposed between tooth and bone. Thirdly, by "gomphosis," that is, placed in separate sockets, and possessing a lining membrane to the sockets.

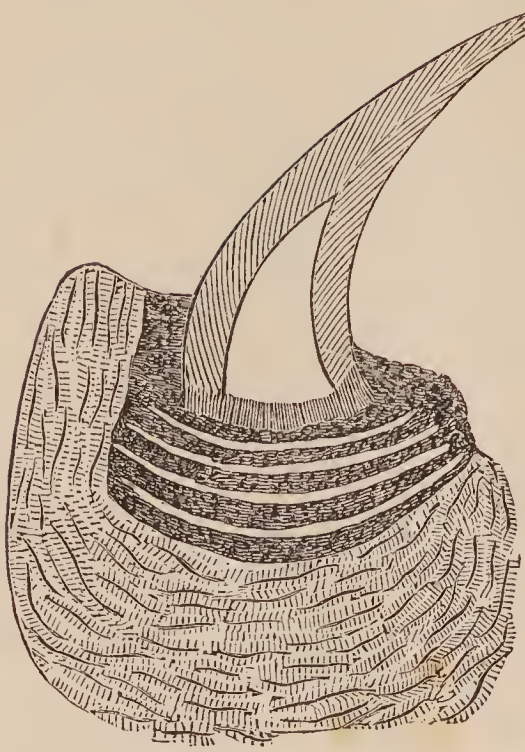
Teeth are now recognised as true dermal appendages; if we take a very young Dog-fish and examine its jaws, we shall find that the skin which is continuous with the mucous membrane of the mouth and alimentary canal, possesses spines or placoid scales,

differing only in size from those on the surface of the body; as the Dog-fish increases in age the teeth become larger and more unlike the scales of the body. These teeth are firmly imbedded in a tough fibrous gum, which is continually growing outwards around the jaws and carrying the teeth with it; in their early stage they are curved inwards towards the throat, but as the gum moves them outwards they gradually assume the vertical position and then turn over the crest of the jaw; after this they are soon shed, and new ones take their places in rotation.

This kind of attachment is characteristic of fishes; there is one instance in which it differs slightly, and that is in the Angler Fish (*Lophius piscatorius*), whose teeth are attached on the inner surface by a tough membrane, and on the outer surface by a much more elastic membrane, the purpose of which is to allow them to bend inwards, thus making a wider opening for the passage of food; after the food has passed the teeth spring up again and prevent its exit. The Hake, one of the Cod tribe, possesses hinged teeth, as also does the Pike, but in this case the teeth are arranged in three rows along the palate, whilst those in the jaws are fixed.

A good example of attachment by "anchylosis" is found in the teeth of the Python; the bases of these teeth are firmly attached to a kind of bony structure, slightly differing from the jaw-bone itself, and of a coarser texture and with a less regular series of lacunæ or bone-cells. (See Fig. 1). Another good example is found in the Eel tribe, whose teeth surmount a short cylinder of bony tissue, which is so firmly attached that when the teeth are shed this bony attachment comes away with them, leaving hollow places in the jaw. In socketed teeth there is a special, highly-organised membrane surrounding the fangs, intervening between the tooth and its alveolus or socket in the jaw. This kind of attachment is found mostly amongst the higher animals; there are a few reptiles and fishes possessing teeth of this kind, but not many. An intermediate stage between the anchylosed and socketed teeth is found in the Haddock, whose teeth, like the Eel's, are placed on cylinders of bony tissue, anchylosed to the jaw; they possess very short fangs, which suddenly become smaller in circumference than the teeth; these fangs enter the cylinders, the projecting shoulders of the teeth resting on the edges. (See Fig. 3).

A Mammalian tooth is made up of hard, dense tissues, strongly impregnated with salts of lime. Let us take as a standard the



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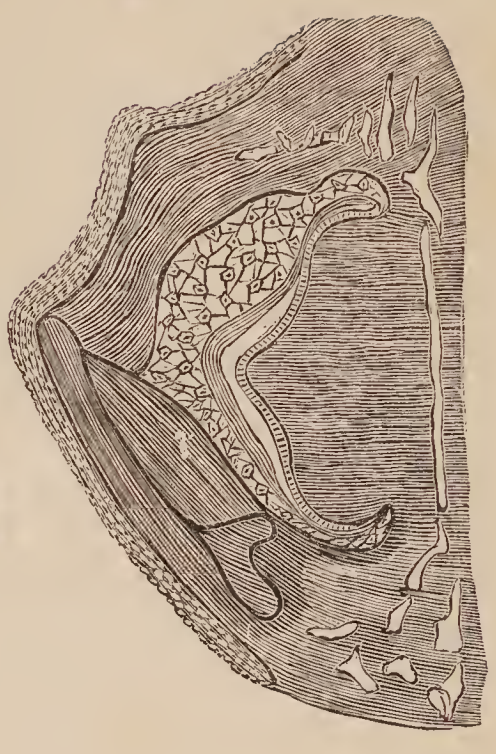

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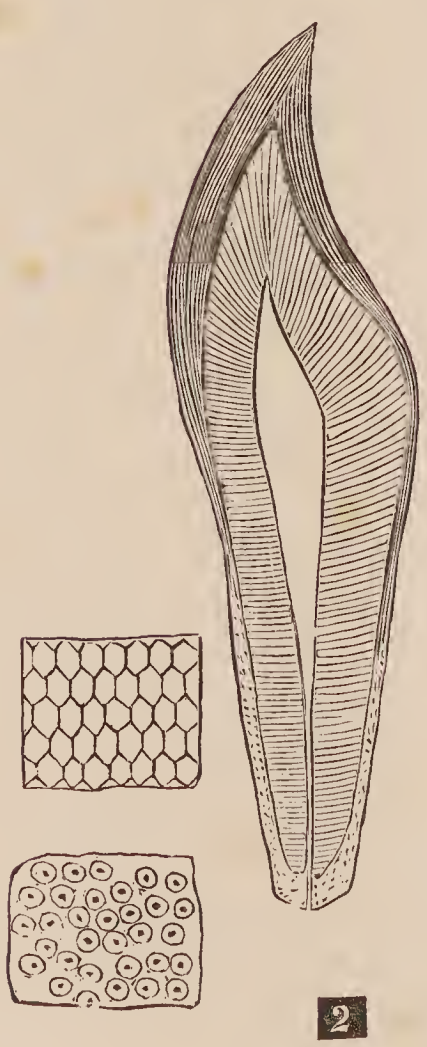

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human tooth. This is composed of four different tissues, viz., the *pulp*, or, as it is commonly called, the nerve ; surrounding this is the *dentine*, or *ivory*. This is covered on the crown, or part outside the gum, with *enamel*, and on the root, or part under the gum, with *cementum*. I will describe these various tissues in detail, and then endeavour to explain how a tooth is built up.

The enamel is the first formed tissue, and it is the hardest of all the tissues found in the human body ; this hardness is due to its possessing very little organic matter, having only about $3\frac{1}{2}$ to 5 per cent., the rest being made up of a large quantity of phosphate and carbonate of lime, with small traces of fluoride of calcium and phosphate of magnesium. The enamel varies in thickness, being thicker upon the cusps of the teeth ; it covers the entire crown of the human tooth, but in some of the lower animals—in the Rodents for instance, whose front teeth are continually growing, the enamel covers only the front surface ; thus, as the teeth wear down on the inside, there is ever a sharp cutting edge of enamel in front. In the back teeth of the Elephant and other Graminivorous animals, the enamel is placed in convoluted layers throughout the crowns ; by the process of mastication, the dentine is worn down, leaving ridges of enamel on the surface ; the teeth are thus always rough and better able to perform their important office. Enamel is formed of hexagonal prisms, or fibres (see Fig. 2), radiating outwards from the dentine in all directions, but not in a perfectly straight line ; the fibres start at right angles to the pulp, and then bend upwards in a curved line, almost in a spiral form, thus making it very difficult, or nearly impossible, to separate a fibre throughout its whole length. Though the fibres of enamel will look almost structureless and homogeneous, they can be proved to be otherwise by immersing a section in diluted hydrochloric acid, when the central portions of the prisms will be dissolved, leaving a network remaining, consisting of the outer walls, which are more dense. Or, again, it may be demonstrated by immersing a section in chromic acid, when the central parts will become green, whilst the outer portion will remain white. When enamel is fractured, it is supposed to occur *through the centre* of the fibres, and *not between* them. In the enamel of some animals, there are cavities near the dentine which are sometimes permeated by dentinal tubes. Of these I shall speak more fully presently.

(To be continued.)

EDITORIAL.

With the issue of the present number the Second Volume of NATURAL HISTORY NOTES is completed, and it affords the editorial mind much pleasure to reflect upon the success which has attended his efforts to promote the study of science by means of the establishment of one among the many "feeders" to the observant mind in the form of a Journal wherein the tyro may record his experiences and observations, and at the same time procure instruction from the pens of able writers upon some of the various branches of Natural Science. We take this opportunity of tendering our sincere thanks to those who have so generously laboured in our cause by contributing to the pages of our magazine, thus testifying to the interest which they take in its welfare. To those also of our subscribers through whose kind assistance many new names have been added to our list, our hearty thanks are due.

It is with hopes of increasing success that we look forward to the publication of our third volume, trusting that none of our present subscribers will desert us, but that the kindly interest which has been taken in the welfare of the magazine during these two years may be continued into the future.

And here, in conclusion, we would wish to impress upon our subscribers the important fact that NATURAL HISTORY NOTES is, as it was originally designed it should be, *self-supporting*, and therefore it is absolutely necessary in order to its maintenance that *all subscriptions for the coming year* should be forwarded *on or before the 31st of the present month.** We especially would desire to bring this fact before the notice of subscribers, since, by sending in their subscriptions whilst this reminder is fresh in their memories, a large amount of trouble and inconvenience, coupled with uncertainty, will be obviated to the Editor, whose work is purely "a labour of love."

NOTES AND QUERIES.

[We regret that want of space compels us to hold over the contents of this column till the January number.—ED.]

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